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Lighting Fixture Market to Light Dawn of New Era

Manufacturers and Dealers All Ready to Assemble at Buffalo Exposition, Feb. 14-19, for Exchange of Ideas and Preparation of Plans to Advance Mutual Interests and Electrical Industry

By WILLIAM B. EASTWOOD

"Every decade sees some one industry take the center of the stage and draw the spotlight of public interest and popularity. In 1901 it was the automobile; in 1911 the motion picture industry forged to the front. This year every indication points to the dawn of a brighter electrical era—the period in which electricity will become universally necessary for convenience, comfort and economy, in business, industry and the home."

The above prophecy was voiced by an energetic factor in the electrical industry who will be heard at meetings during the Lighting Fixture Market in Buffalo, N. Y., Feb. 14-19, where he will strive with others of the industry to pave the way for the realization of the prophecy. Some vital problems will be presented for solution, beneficial ideas will be exchanged and unusual merchandising opportunities will be afforded at this exposition, the most elaborate and comprehensive in the history of the lighting fixture industry.

At the Buffalo Lighting Fixture Market the products of more than 100 manufacturers of elec-

Recent View of Elmwood Music Hall, Buffalo, N. Y., in Which the Lighting Fixture Market Will Be Located Feb. 14-19.

tric lighting fixtures and accessories will be displayed in Elmwood Music Hall. These manufacturers, representing millions of dollars in industrial investments, will exhibit lighting units and equipment valued in excess of $100,000, and including designs for every class of business, industrial and residential installation. Electrical contractors, architects and the general public will have an opportunity to study illumination, select styles and types of fixtures and exchange constructive ideas with the manufacturers who are prepared to meet every demand in designs and assist to the utmost the work of advancement toward better illumination.

Men Who Are Charged With Success of Lighting Fixture Market.

Success of the National Lighting Fixture Market will be due primarily to the indefatigable efforts of the officers and members of the executive committee of the National Council of Lighting Fixture Manufacturers. This success, however, will have been materially promoted by those who exhibit their products in the 102 spaces in Elmwood Music Hall, and by those who are prepared to present problems for discussion at the meetings of the contemporaneous conventions of manufacturers and dealers.

Fred R. Farmer, president of the Beardslee Chandelier Manufacturing Co., Chicago, heads the list of exposition workers in his capacity as president of the National Council of Lighting Fixture Manufacturers. Mr. Farmer's executive ability is unquestioned, and his faculty of inspiring others to enthusiastic and energetic effort is an important factor in the making of a successful exposition. He is ably seconded by William Horn, president of the Horn & Brennen Manufacturing Co., Philadelphia, and vice-president of the national association.

Charles H. Hofrichter, president of the Crescent Brass Manufacturing Co., Cleveland, serves the lighting fixture industry indefatigably the year round as secretary-treasurer of the National Council of Lighting Fixture Manufacturers. His capacity for work and knowledge of the fixture business have made Mr. Hofrichter the busiest of business managers for the Buffalo exposition. To him will fall a major portion of the credit for the success of the event.

The members of the executive committee, all of whom have contributed liberally to the making of the record lighting fixture exposition, include D. C. De Lancey, treasurer and manager of the Crown Electrical Manufacturing Co., St. Charles, Ill.; E. F. Guth, president of the Luminous Unit Co. and the St. Louis Brass Manufacturing Co., St. Louis; M. D. Blitzer, of the Lightolier Co., New York City; Herman Plaut, president of L. Plaut & Co., New York City; Benjamin F. Klein, president of the Kayline Co., Cleveland, and Arthur Polacheck, active head of Charles Polacheck & Bro. Co., Milwaukee.

During the exposition there will be three large conventions of men in the lighting fixture industry and allied interests. The convention of the National Council of Lighting Fixture Manufacturers will represent the manufacturing side of the fixture business, that of the Lighting Fixture Dealers' Society of America will consider problems of jobbers and retail dealers, and the Illuminating Glassware Guild will represent the third important group in the lighting fixture business.

Interesting the Public in Purchase of Appropriate Fixtures.

One of the first problems which will come up for consideration at the convention of the manufacturers will be that of interesting the general public in the selection and installation of modern lighting fixtures. It is to be determined what methods may be used to convince the householder that each residence presents an individual problem in illumination—that fixtures should be installed to harmonize with the decorative scheme of each room and that the proper lamps be used for giving just the right intensity and diffusion of light.

In order that the householder or flat dweller may become more interested in appropriate fixtures from the standpoint of decoration and dissemination of light, it is possible that the manufacturers may extend the standardization of fixtures to the making of all residence units of the quickly removable type. The ability to quickly attach or detach a ceiling fixture or wall bracket by simply inserting or withdrawing the plug and hanging it on or detaching it from a hook will, it is believed, go a great way to solve the problem of making modern lighting fixtures popular. People who rent could then transport their fixtures from one house to another, like furniture, and not be compelled to endure some of the makeshifts installed by the landlord. The removable fixture would also give the retail dealer more sales points and result in greater effort to sell them.

Solution of Retailing Problem to Be Considered by Manufacturers.

Much consideration will be given by the manufacturers and dealers to the subject of retail distribution. It appears that the manufacturers look forward to a greater movement of their products through the retail channels to the consumer, and the dealers on their part, with some exceptions, have had more interest in the sale of electrical appliances for saving labor in the household than they appeared to have in the sale of lighting fixtures. The manufacturers will seek more aggressive action on the part of the retail dealers or they will consider other means of distribution.

Those contractor-dealers who report success in the sale of lighting fixtures have paid more than passing attention to questions of better illumination and the selection of fixtures to match the decorative scheme of the rooms for which they are intended. They have tried to arrange their displays of ceiling and wall fixtures, bowls, canopies and shades in the most distinctive manner possible to facilitate selection by the customer and to stimulate turnover. Unit displays in wall cases have been undertaken by some, others have arranged a series of naturally decorated rooms with fixtures installed to match the trimmings of the room just as it would appear in the home. These rooms represent a living room, dining room and bedroom. Lack of store space does not permit many of them to install such display rooms.

Those electrical dealers who have complained that the lighting fixture business is not good with them will probably come in for special attention under whatever plan of campaign the manufac-

turers may outline at the convention. Special representatives who are trained in at least the rudiments of illuminating engineering and who may be classed as experts in the merchandising of lighting fixtures, may be sent out to do missionary work among the unsuccessful dealers. It seems to be the desire of the manufacturers to see their products marketed through the regular electrical contractor-dealer channels, with the assistance of the manufacturer in national advertising and the usual "dealer helps."

Along this line the convention of manufacturers will probably develop the question of a radical change in the retail plan of distribution which would involve the organization of a system of specialization and the establishment of chains of stores devoted exclusively to lighting fixtures and their accessories. With their highly developed means of research and survey of marketing conditions throughout the country, the manufacturers of lighting fixtures and affiliated industries have positive knowledge that the time is at hand for intensive development of the fixture business. Such development is in line with present high developments in the production and use of electricity.

No Prospect of Lower Prices in Lighting Fixture Business.

"Every purchaser of chandeliers, whether for resale or for his own use, is naturally interested in the price readjustments now taking place in other industries and is wondering whether lighting fixtures will soon sell at lower prices," says Fred R. Farmer, president of the National Council of Lighting Fixture Manufacturers. "I do not believe they will. This is my opinion as a manufacturer of lighting fixtures and it would be quite properly open to the suspicion of bias if I merely stated it and let it go at that. So let me give my reasons for believing that the better grades of lighting fixtures will not sell at lower prices in the near future and you can then form your own conclusions as to the correctness of my opinion.

"In the first place, the greatest reductions in prices that have occurred within the past year have been in those industries in which the cost of raw material and wages were increased inordinately during the war. These industries are, in general, those for whose products an abnormal demand was created by the need for provisioning, clothing and arming several million men. The prices of everything needed by the troops advanced rapidly because of the increased demand for them. But there was no increase in the demand for lighting fixtures during the war; on the contrary, the demand was below normal owing to the suspension of building operations, a condition that still prevails.

"If this is true now, when business is admittedly dull, what will happen when the revival of building operations, which is certain to come before long, stimulates the demand for lighting fixtures? Will prices fall in a period of increased demand? I think not."

That the prices on lighting fixtures will not be lowered seems, in fact, to be the consensus of the manufacturers attending the Buffalo exposition and convention. These manufacturers will, instead, concentrate upon design, material and workmanship in order to give greater value for the money at present prices. In this possible decision the manufacturers of lighting fixtures will be guided by tradition in the automobile industry. In the latter industry the policy which spelled its success was that of maintenance of price and refinement of the product. It should win with fixtures.

"Any man with an eye to good lighting can walk along any street in any city or town and point out inadequate, improper or extravagant lighting installations in nine-tenths of the places —all marks of neglected opportunity on the part of electrical contractors and fixture dealers," said a fixture manufacturer in commenting on tremendous trade possibilities awaiting the industry.

Some of the most successful salesmen of fixtures are those who induce a prospective customer to let them install one unit by way of trial. Since the salesman knows what his fixtures will do in the way of "showing off" the old fixtures, his confidence is nearly always rewarded with a sale. If the electrical contractor could think up some such plan of interesting the home-owner and landlord in electrical installation, what a harvest he could reap! There are approximately 24,400,000 homes in the United States. Of these there are about 9,200,000 homes wired for electricity and 15,200,000 homes without electric service.

CONVENTION FACTS AND FEATURES

Manufacturers' headquarters at Lafayette Hotel.

* * *

President Farmer, President Netting and Edwin Gillinder will tell the industry at the first meeting what it needs most.

* * *

Wednesday noon, Bill Goodwin will preach the gospel of co-operation. Don't miss it!

* * *

Whiting Williams will have a message for you Thursday noon on "The Industrial Mix-up."

* * *

Daily "wuxtras" of the National Lighting Rays will be distributed on the convention floor.

Recent convention pests known as Hard Times, No Business, Pessimism, etc., will be turned away at the door.

* * *

Business sessions will be held each morning from 9:30 until noon. Don't miss any of them.

* * *

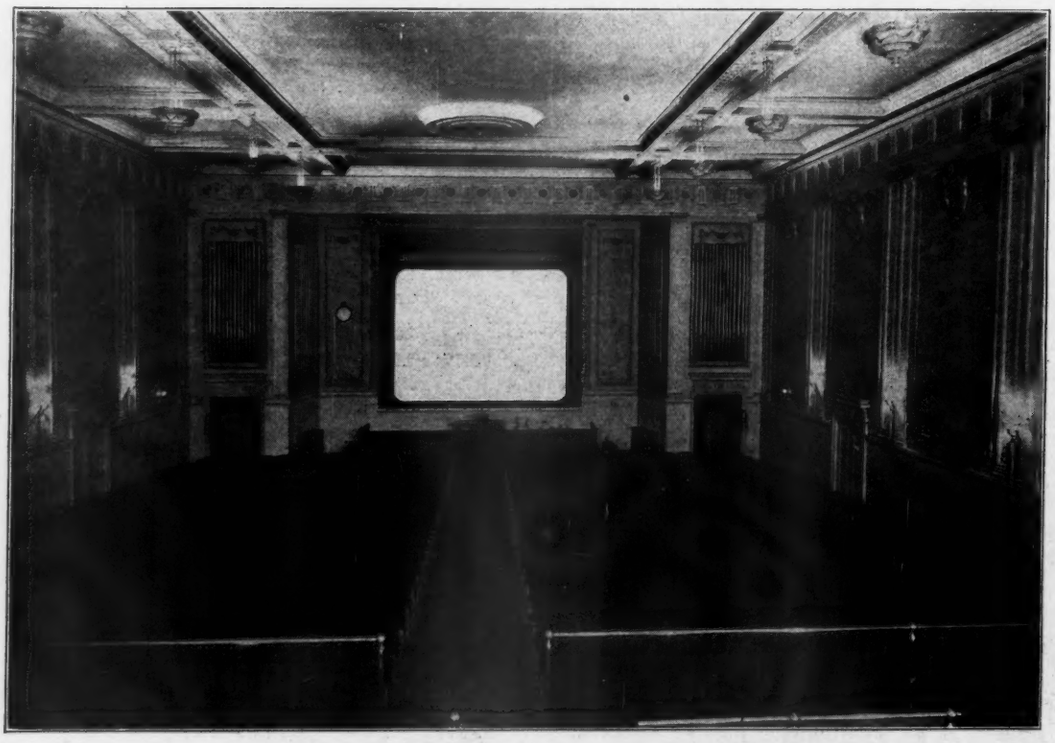
Don't forget to register! The fee will be the same as at the Detroit Market, namely $10, and will include the four luncheon tickets, a banquet ticket and a trip to Niagara Falls.

* * *

Dana Pierce, vice-president of the Underwriters' Laboratories and chairman of the National Electrical Code revision committee, will address the convention session on the morning of Feb. 17. It will be a privilege to hear him.

Examples of Good Lighting Installations for Theater and Auditorium

Installation in Roosevelt Auditorium at Mooseheart, Ill.



Installation in Regent Motion Picture Theater, Pittsburgh.

Theater and Auditorium Fixtures and Illumination

Pleasing Effects Produced by Selecting Equipment Harmonizing in Size and Design with Space to Be Lighted — Some Typical Examples of Theater Installations — Good Auditorium Lighting

By H. A. HARRIS*

Almost every town has its theater since the mushroom growth of the moving picture. The old opera house, where itinerant thespians and frock-coated barnstormers once cavorted has been replaced by an up-to-date playhouse, and the smelly kerosene lamps and candles with tin reflectors have been forced out by better illuminating equipment. There are but few towns without electric lights, and fewer theaters in which electrical illumination is not used.

The business of theater lighting is worthy of careful consideration by the electrical contractor-dealer and fixture manufacturer. The unusual amount of wiring required in the larger theaters, and the extensive use of various types of illuminating equipment, creates a particularly attractive job, which can be made very lucrative when properly handled.

It is impossible to take up in detail the system of wiring for the average theater, but it may be stated briefly that the wiring system divides itself into three parts—the stage lights, house lights and exit lights. In addition there are various light and power circuits necessary for electric signs, ventilation and heating equipment, projecting lanterns, theater dimmers and remote-control systems. The auditorium, foyer and lobby are generally supplied from the same source. Laws and ordinances, operative in many states and cities, require separate circuits for exit lights and special precautions for projecting lanterns, spotlights, etc. There are a few set rules which apply to every theater job and these should be studied carefully in order to get the best possible results in the building under consideration.

Play Houses and Moving-Picture Theaters Have Different Requirements.

Theater lighting may be divided into two distinct classes—the play house and the movie theater. First, we will consider the playhouse, as it is the least complicated of the two, the larger movie theaters having made necessary a much more complicated system for proper illumination. In general, all lights in the auditorium of the playhouse, except the exit lights, are extinguished during the performance. Stage lighting rarely comes in the fixture man's contract, and, therefore, will not receive more than a passing comment here.

As the lighting equipment varies in accordance with the architectural scheme and size of the theater, the best results can be obtained if the salesman and designer work in conjunction with the architect. The architect first decides the general scheme he wants to work out and then prepares his designs with an eye to having all of the decorative features of the house blend to make one harmonious effect. For this reason, if close contact does not exist between salesman, designer and architect, the desired results are not often obtained. The designer should make his work conform to the ideas of the architect. Of course, in the absence of definite information the designer should use his own judgment in sizing up the situation, planning the number of lights for each fixture, its size, general form, and the character of its design, and be able to submit something to the architect and to the owner which will at least make a good impression.

The theater owner is almost always a man who has made his money by pleasing the people. He knows what people like. If it is pointed out to him that more people will be attracted to his theater if unusual illuminative effects are made a part of the program, and increased profits resulting therefrom will offset the added expense, he will approve a large enough expenditure to give him what he should have.

Large motion-picture theaters offer an even greater opportunity. In the movie house there must be illumination at all times, but this illumination must be regulated so that the proper effect will be obtained when the picture is being shown and during intermissions. The light that is to be "on" during a picture requires careful study, as it is necessary to secure sufficient illumintaion and yet not enough to interfere with the picture on the screen. Enough light is required at all times

Foyer of Rivoli Theater, La Crosse, Wis.

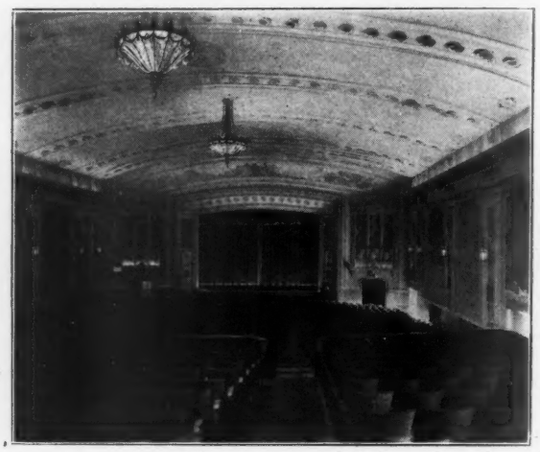
*Lighting Specialist With Beardslee Chandelier Manufacturing Co., Chicago.

to enable patrons to find their seats or to leave the theater. Some theaters run continuous performances while others show one reel after another with short intermissions.

Lights which are "on" continuously in the movie house should be amber in tone, as this color does not greatly interfere with the picture on the screen or cause eye strain in the audience. This effect may be obtained in many ways, either with brackets, ceiling lights or by using amber bulbs with silk shades, art glass, parchment shades, etc. It is obtained most frequently with both brackets and ceiling lights.

Dimmers Used to Produce Varying Effects During Performance.

In the movie house in particular, and in many spectacular shows, dimmers are used to give various color and light-tone effects to accompany the musical and pictorial features of the performance, the orchestra leader indicating the lighting effects in many of the movie houses.



Auditorium of Rivoli Theater, La Crosse, Wis.

In the moving-picture theater and also in many spectacular shows "stage lighting" is practiced in the auditorium during the performance so that varied hues and tints are flashed on to harmonize with musical and scenic effects. An attempt is made to interpret the music or the picture in varying shades of color and by so doing to keep the spectators in the desired mood. In harmonizing light effect with music it is possible to parallel the theme of an overture with a color scheme that supports and amplifies the appeal of the music.

In planning for and estimating on all classes of theater lighting the job should be started as soon as plans of the building are furnished. The fixture man should study the plans; study the opportunities for illuminating equipment from a practical as well as an artistic standpoint. He should decide whether the outlets marked on the plans will give the best results, and if he feels that such is not the case he should make suggestions that will improve on the plans already drawn. Of course the architect should be consulted and the suggested changes shown to be desirable.

The electrical man who equips a theater can profit from an advertising standpoint, as the illuminating equipment will be seen by thousands of theater goers whose homes, offices, show rooms, factories, banks, schools, restaurants and hotels may be in need of equipment which he can supply.

An interior view of the Regent theater, one of the prominent moving-picture houses in Pittsburgh, Pa., is shown in an accompanying illustration. On the side walls of this auditorium there are 12 composition 2-light side-wall brackets finished in dull old gold with gold-colored silk shades lined also with gold in order to give an amber-colored light. Amber dipped 15-watt lamps are used in these brackets.

Bracket lights are left on during the whole display in order to give sufficient light to enable patrons to find seats or to find their way out when ready to leave. Suspended from the main ceiling there are ten 6-lamp indirect fixtures. These are of composition and are finished in ivory and gold, each fixture being wired with two circuits. One circuit is for general light between the pictures and consists of four 60-watt lamps in each fixture, all on a pair of 3-way switches controlled either by the operator or by an usher. The other circuit supplies only two 20-watt amber-dipped lamps in each fixture to give a soft amber-toned light during the presentation of a picture. There is a variation in the lighting required for different pictures, and some will stand more light than others. For this reason this circuit is arranged with five switches, each switch controlling a pair of fixtures so that from two to ten fixtures may be lighted according to the requirements of the picture being shown.

The "Bleachers" in the rear of the auditorium run well up in the back and have the entrance and the exit passages underneath. Over the rear of the bleachers there are three ceiling lights of the same types as those on the main ceiling, but smaller in size and with three 15-watt lamps in each. These, being out of the line of vision, are always left turned on during the time the house is open.

The Rivoli theater at La Crosse, Wis., presents a typical example of good lighting practice. The ceiling fixtures, shown in an accompanying illustration of the interior of this theater, were designed especially to harmonize with other features of interior decoration as well as give adequate and pleasing lighting effects.

Fixtures in the auditorium at Mooseheart, Ill., in addition to harmonizing with their surroundings and supplying adequate lighting, have a special feature of interest. These fixtures were built by the students at Mooseheart, the metal parts being purchased and the composition bodies made by the students themselves.

At a recent conference of metermen at Columbus, O., it developed that some operating companies in that state followed a practice of connecting relays and watt-hour meters to the secondaries of the same instrument transformers. After a full consideration and discussion participated in by both the manufacturers and operating men it was agreed that such connections should not be made. It was developed at this meeting that glass covers for customers' meters have many advantages.

ILLUMINATING CITY STREET WITH SEARCHLIGHTS.

Long-Distance Projection of Light From Central Location—Problems Involved in Selection of Proper Street Illuminants.

A novel way of illuminating a street at night is found in Oakland, Cal., where one street is lighted by a battery of four large searchlights mounted on an ornamental framework which happened to be in an advantageous position. The resulting light is a flood of evenly diffused rays instead of the usual combination of bright and dark patches made by the ordinary street lights. The searchlights are sufficiently high so that they do not blind pedestrians.

This installation is presented, however, as an interesting exception to the general rule of street lighting, for experience has shown that, other things being equal, street lighting is good when many lamps are installed at frequent intervals and that it is poor when few lamps are installed at great intervals. It has also been observed that lamps having concentrated downward distribution are not quite so effective, other things being equal, as lamps delivering more light at angles somewhat farther up toward the horizontal. Both these conditions of superiority have involved a closer approach to uniformity of light distribution along the street than was had under the conditions of inferiority against which they have been contrasted.

Factors Involved in Securing Uniform Street Lighting.

Largely upon this basis it has become almost an accepted dictum of illuminating engineering that uniformity is a first desideratum in street lighting. Thus an ideal for street lighting has been formed without trial and possibly without consideration of other factors which would be likely to be involved in the effort to secure uniformity. For years uniformity has been held up as the important end to be attained in street lighting, and has been attained or approached only through the installation of lamps so closely spaced that without disturbance of their natural light-distribution characteristics the desired end was attained.

Under these conditions no occasion arose to question the desirability of uniform street lighting, such illumination being eminently satisfactory. However, the development of the refractor has made possible the attainment of greater uniformity in street lighting by distortion of the light-distribution characteristic of illuminants, giving the desired effect with relatively wide lamp-spacing intervals. In a few cities this type of lighting has been indulged in upon a considerable scale, so that for almost the first time it has been possible to study so-called uniform lighting and to appraise its value.

Uniform lighting is generally taken to mean uniform distribution of horizontal illumination intensity along the street. Such lighting so obtained is found to suffer from certain undesirable qualities, as follows: The intensity of the light distributed just below the horizontal is much increased, and as the refractor or the apparent source is relatively small the result is excessive brightness at angles certain to produce deleterious glare. By reason of the same distribution characteristic, the proportion of light delivered within relatively narrow zones upon building fronts, trees, or field is large and the proportion of light delivered upon the street is relatively small.

Whenever such lighting is employed on business streets bounded by important buildings the lighting effect on the building fronts is most displeasing, due to the eccentric distribution. Last but not least, the ordinary refractor secures an increase in the light delivered somewhat below the horizontal by robbing the street in the neighborhood of the lamp of that strong intensity which is so important to the excellence of the general illumination on the street.

Diversity of Opinion Regarding Proper Arrangement of Street Lighting.

At the present time there is considerable diversity of opinion in theories of street lighting. It must be recognized, however, that street lighting has suffered much more from excessive nonuniformity than it has from uniform distribution of light, and that if in a few instances the pendulum swings too far in the direction of uniformity the final result will probably be salutary in assisting to bring general practice to that point between extremes which will be found to be sound both theoretically and practically.

Searchlights Used for Illumination of a City Street.

Uniformity of horizontal illumination on the street is not the most important consideration, and it should not be had by an excessively great departure from natural distribution of light. A moderate diversity of illumination, avoiding on the one hand dark areas between lamps and on the other hand that close approach to uniformity which is demanded by certain engineering theories rather than by practical considerations, will be found to be most advantageous wherever effectiveness is measured by the success with which the street lighting serves the purposes for which it is designed. Thus the present-day tendency may be said to be toward a closer approach to uniformity in street lighting.

Helping the other fellow to become successful is the kind of business diplomacy that reduces offensive competition.

City Business Districts Demand More Efficient Street Illumination

The recent increase in efficiency of light production and the development of merchants' lighting known as "White Way Lighting," have given an impetus to the use of higher intensities in street lighting. This movement is still under way, new and remodeled installations recording distinct advances over earlier installations in respect to intensity. An added illuminating effectiveness thus achieved has been enhanced by the demand for more artistic posts and fixtures, promoting the attractive appearance of the installation both by day and by night. While municipal appropriations for street lighting are larger than formerly, it is doubtful if there has been much increase per capita. Thus it is the higher efficiencies of illuminants and the growing preference for tasteful fixtures that chiefly are responsible for the advance of recent years in street-lighting practice. In the upper view is shown an installation in Cleveland of street lanterns equipped with 1500-watt, type C lamps and prismatic reflectors. The lower view shows a night scene on Broadway, Saratoga Springs, N. Y.

Department Store of West-Dyer Co., Blackwell, Okla. Williamson Units Installed by Blackwell Electrical Supply Co.

Improving Lighting Conditions in Department Stores

Survey in Prominent Stores in Large Cities Shows Need of Increasing Illumination in Many Places—Lower Floors Are Lighted Best—Paper Before Illuminating Engineering Society

By J. DANIELS

The fundamental basis on which a large number of business decisions are formed is a comparison between a merchant's own practice and that of his competitors and others engaged in the same or similar line of business. Lighting engineers have long been aware of the fact that this principle is an important factor in securing increased intensities in store lighting. This fact formed the basis for a careful comparison of foot-candle intensities between department stores in the cities of New York, Boston, Philadelphia and Newark, N. J.

By means of a foot-candle meter, a series of measurements were taken in each department of the following stores: In New York City, B. Altman & Co., Arnold Constable & Co., Best & Co., Bonwit Teller & Co., Franklin Simon & Co., Gimbel Bros., Lord & Taylor, Jas. McCreery & Co., R. H. Macy & Co. and Stern Bros.; in Boston, Wm. Filene's Sons Co., Gilchrist Co., Houghton & Dutton Co., C. F. Hovey Co., Jordan Marsh Co., Shepard Norwell Co., R. H. Stearns & Co., A. Shuman & Co., R. H. White Co.; in Philadelphia, Gimbel Bros., Lit Bros., Strawbridge & Clothiers, John Wanamaker, N. Snellenberg & Co., and in Newark, N. J., L. Bamberger & Co. and Hahne & Co.

Lighting Intensities Actually Used in Department Stores.

Readings were taken on either the counter or table level where goods are shown, thus giving the figure with which the user is most concerned. It was found that the majority of stores had similar departments on corresponding floors. That is, notions, hosiery, stationery, haberdashery and jewelry were sold on the first floor; women's skirts, cloaks, suits and gowns on the third floor,

etc. As the average illumination of the several departments on the same floor did not vary greatly, due to the uniformity of the lighting installation throughout a floor, the comparison herewith shown is given by floors.

In the accompanying tables the different stores are designated by numbers which, however, are not in the same sequence as used where the names are stated. The illumination recommended for department stores by this society is six to ten foot-candles for first floors and four to eight foot-candles for others.

This comparison, when presented to the executives of the stores in Boston, stimulated an interest in store lighting. It manifested itself immediately by requests from managers for information for bettering conditions. In the case of

TABLE SHOWING FOOT-CANDLE INTENSITIES OF ILLUMINATION FOUND IN NEWARK DEPARTMENT STORES.

Store No.	1	2
First floor	5.3	2.5
Second floor	3.3	2.5
Third floor	2.0	3.5
Fourth floor	...	2.25
Fifth floor	...	2.6
Sixth floor	...	2.5
Basement	3.75	3.5

store 5 in Boston, the superintendent made a personal investigation of store lighting practice in the larger cities as far west as Chicago. Word has been heard indirectly of discussions between store men concerning the lighting in their stores; something they frankly admitted they had never seriously considered it before.

Results Obtained by Calling Attention to Good Practice.

The following results can be traced directly to this comparison: Store No. 1 had under consideration the reducing of their units from 750 watts per bay to 500 watts. They have now definitely given up this idea. Store No. 2 has made minor changes on the third floor. Store No. 3 has increased the sizes of the units on the first and third floors, increasing the consumption by 2000 kilowatt-hours over a corresponding period last year, or 8.3%. The entire remodeling of the lighting equipment is also under consideration. Store No. 4 has made changes on the first and third floors, increasing the consumption by 4000 kilowatt-hours over last year, or by 10.5%. While considering the question of lighting, the management of this store asked for suggestions regarding their display windows, with the result that the old equipment of 100-watt type C lamps on 24-in. centers in trough reflectors, used in 18 show windows, have been replaced by X-Ray reflectors spaced on 15-in. centers and equipped with 100-watt type C2 (daylight) lamps. Store No. 5 has made changes on the first and third floors, increasing the consumption by 4000 kilowatt-hours, or 8.3% over last year. Store No. 6 has changed the lighting installation throughout. On the first floor, twenty-seven 300-watt units were replaced by eighty-nine 300-watt units, the other floors being treated in a like manner. The consumption was increased from 14,000 to 38,000 kilowatt-hours, or by 163%. Store No. 7 will replace, on four floors, clusters of four 100-watt type B lamps, controlled by electrolier switches, by fixtures designed to hold 500-watt type C lamps. Store No. 8 has increased the size of the units on the second floor from 200 to 300 watts, and radical changes

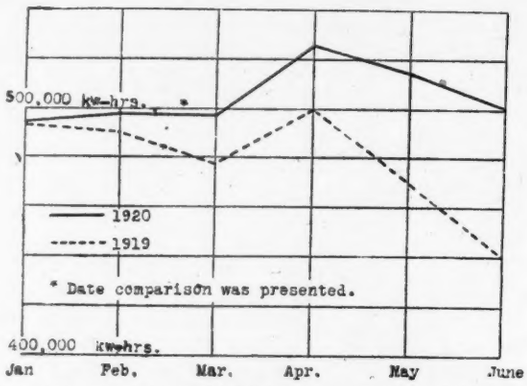


Chart Showing Energy Used by Eight Department Stores in Boston Before and After Studying Lighting Conditions.

throughout the remainder of the building are being contemplated. Stores No. 9 and 10 are using 300-watt lamps in over 1200 fixtures and are contemplating replacing them with 400-watt lamps.

Store Owners Often Consider Lighting as an Item of Expense Only.

The store managers are receptive in this respect. The source of most of their information on this subject is the fixture salesman. The fixture or specialty salesman constantly drills into his customers' ears the fact that his fixture has a greater efficiency than that of his competitor, with the result that there is a tendency to reduce sizes of units installed rather than to increase them. The responsibility for the lighting equipment is usually in the hands of the engineer or

TABLE SHOWING FOOT-CANDLE INTENSITIES OF ILLUMINATION FOUND IN PHILADELPHIA DEPARTMENT STORES.

Store No.	1	2	3	4	5
First floor	5.0	4.0	3.1	2.1	1.75
Second floor	5.0	5.0	2.0	2.25	1.5
Third floor	2.5	3.5	2.0	2.0	2.25
Fourth floor	1.5	3.0	2.0	1.5	1.75
Fifth floor	4.0	2.0	2.0	1.5	2.0
Sixth floor	...	6.0	...	...	1.75
Seventh floor	...	2.75	...	...	1.5

TABLE SHOWING FOOT-CANDLE INTENSITIES OF ILLUMINATION FOUND IN BOSTON DEPARTMENT STORES.

Store No.	1	2	3	4	5	6	7	8	9	10
First floor	5.1	4.5	4.2	4.0	3.7	2.9	2.75	2.5	2.5	1.7
Second floor	4.7	4.75	3.7	4.6	3.2	2.7	3.3	2.8	2.1	1.5
Third floor	4.25	2.5	3.0	3.75	2.9	2.5	2.7	2.0	1.6	1.5
Fourth floor	5.5	2.75	2.0	2.6	2.9	3.0	2.6	3.0	2.2	1.5
Fifth floor	4.2	...	1.25	...	2.8	...	1.75	2.4	...	1.5
Sixth floor	3.2	...	...	...	1.0	...	...	...	...	1.6
Seventh floor	3.6	...	...	...	1.5	...	...	...	...	1.75
Eighth floor	2.0	...	...	...	3.0	...	...	...	...	...
Basement	3.2	...	2.75	...	1.7	...	2.0	...	3.5	1.0

electrician whose initiative in advocating changes in lighting is tempered by the constant admonishment by the management to keep down expenses. Final decisions regarding illumination are made by the store principal. Unfortunately most principals believe that lighting is an expense, some going so far as to say that good lighting is a detriment as it allows customers to see the inperfections in goods. This is almost unbelievable in an age when "Service First" is one of the cardinal principles of a successful business, but it is nevertheless true.

There is no reason for doubting but that stimulative lighting in department stores will increase sales and the efficiency of employes in a similar manner to the increased production brought about by improving industrial lighting. The intensities recommended for department stores are, as stated above, six to ten foot-candles for the first floor and four to eight foot-candles for other floors. These intensities are by no means excessive, and a trial by any fair-minded executive would soon convince him of the desirability of this intensity of illumination.

A simple method to show what intensities are desirable to examine merchandise is given herewith. In a room where the illumination varies greatly, or from 0.5 foot-candle to 25 foot-candles, ask a store manager to pick out spots where in his opinion it is possible to examine different classes of merchandise properly. In the majority of cases points will be picked out that are illuminated with intensities twice as great as those recommended by this society, and often four times as great as that found where the goods are actually sold in that particular store.

Opportunity Is Open for Improvement in Store Lighting.

High intensities permit a proper and speedy examination of merchandise, thus speeding up the operation of selling. Employes are enabled to find goods quickly and eye-strains and the accompanying headaches will be eliminated. An improvement in the esprit de corps and personal appearance of the employes is noticeable in those stores having the higher intensities. The remedy for the present condition offers as great a field for the illuminating engineer as that which has been opened by one of the great western companies in industrial lighting. Executives should be impressed with the desirability of the proper intensities by demonstrations on the part of the central-station companies.

Where stores persist in burning lamps longer than the recommended life, removal of such lamps to the floors, say, above the second serves to maintain the illumination of the lower floors at a desirable intensity. The use of a larger-size lamp than would be used under normal conditions serves a double purpose. By this means a high intensity is obtained with its resultant benefits, and the maintenance schedule can be lessened considerably with a negligible loss in foot-candle intensities.

HYDROELECTRIC DEVELOPMENT IN NEW ZEALAND.

As a part of the program of the Government and people of New Zealand to develop its extensive waterpower resources, the Southland electricity power board has recently invited tenders for the hydraulic and electrical equipment for two 3000-kw. units, together with the accessory equipment for the initial installation at the new hydroelectric generating station at Lake Monowai, near Invercargill, Southland, New Zealand, the ultimate capacity of which will require six such units.

It is the intention of the board to sell the power direct to the consumers in the country districts, but boroughs and towns will have the alternative privileges of either buying the power in "bulk" and distributing the supply within their own boundaries or of permitting the power board to distribute the energy as in the country districts.

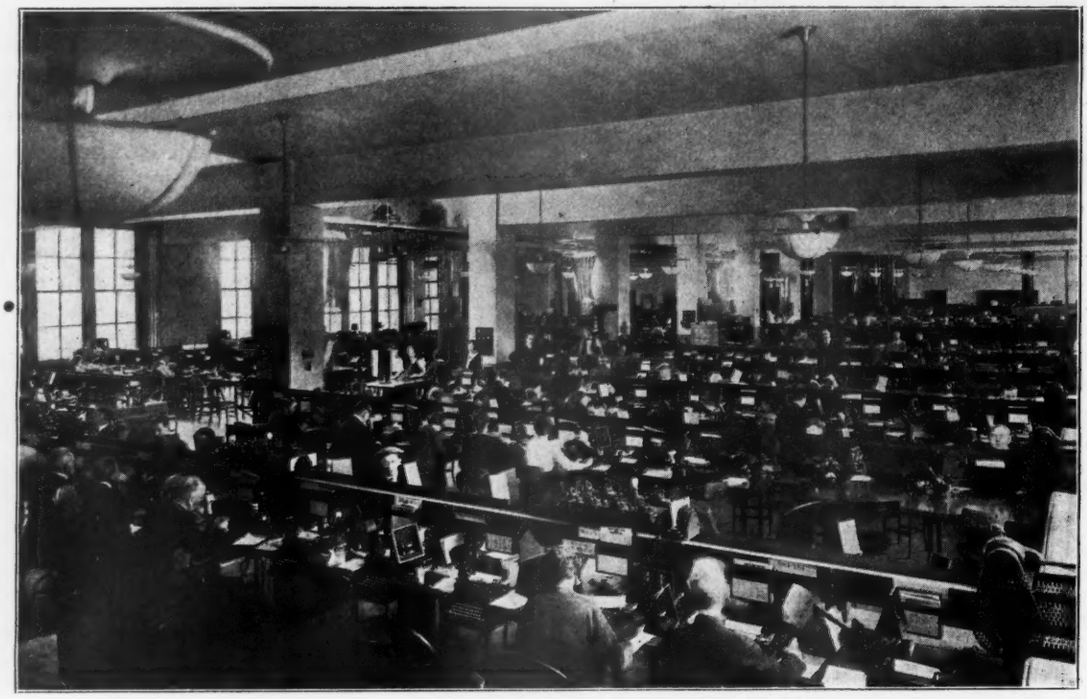
At present New Zealand is employing only 50,000 hp. of its available water power. Of the 21 major installations, two are operated by the state, 14 by local authorities, and five by private companies. Heretofore the water power of New Zealand has been primarily used for hydraulic mining and for water motors for driving mining machinery.

Recently, however, there has been a rapidly growing appreciation of the economic benefit of developing hydroelectric projects. Last August the minister of public works stated that electricity from water power could economically replace coal to the extent of 1,250,000 tons per annum, which is about half of the Dominion's present annual coal requirements, and make a still further saving by reducing the requirements for firewood and mineral oils. Recently the minister estimated the capital expenditure to carry out the North Island scheme outlined by Evan Parry in his 1918 report at £10,000,000, while the South Island schemes would involve an equal outlay. These estimates cover expenditures by the government alone in erecting generating stations and transmission lines to the main centers of distribution. Approximately an equal amount would be required to distribute the power to the consumer. Already nine district power boards, each having jurisdiction over large areas, have been formed to co-operate with the Ministry of Public Works, and it is probable that a hydroelectric advisory board consisting of engineers and commercial men will soon be formed to further assist the minister. New Zealand's increasing population is forcing the Dominion out of the agricultural stage into the industrial stage.

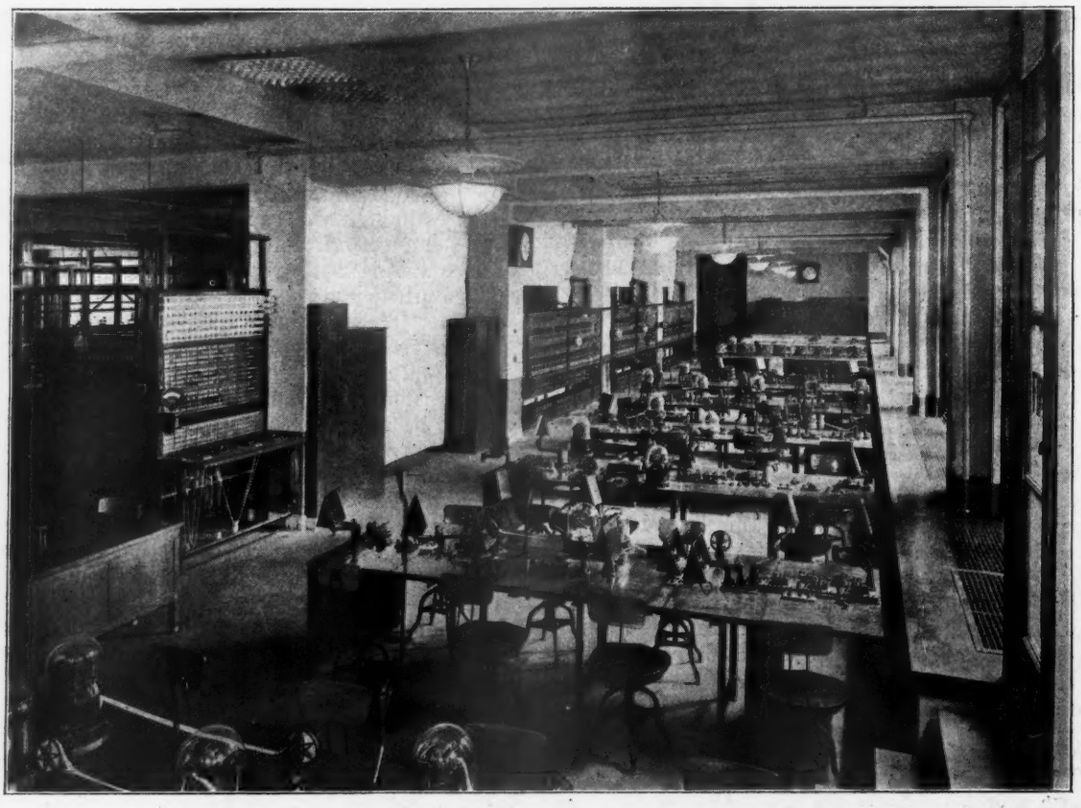
TABLE SHOWING FOOT-CANDLE INTENSITIES OF ILLUMINATION FOUND IN NEW YORK DEPARTMENT STORES.

Store No.	1	2	3	4	5	6	7	8	9	10
First floor	6.0	4.5-6.0	5.5	5.0	4.0	4.0	4.0	3.5	3.0	2.75
Second floor	3.5-5.0	3.5	4.5	2.4	4.0	3.25	2.25	2.5	3.0	2.5
Third floor	4.0	3.5	4.5	2.5	4.0	3.25	3.0	2.75	4.0	3.0
Fourth floor	4.5	4.0-7.0	4.5	3.0	3.5	4.0	2.25-4.0	3.5	2.0	2.5
Fifth floor	5.0	3.5-4.5	...	6.5	4.5	3.0	2.25	4.0	...	2.5
Sixth floor	...	...	...	2.75	3.0-4.5	3.0	2.25	2.75	...	4.0
Seventh floor	...	...	...	...	1.0	...	1.75	3.75	...	...
Eighth floor	...	...	...	...	3.5	...	...	2.5	...	...
Basement	...	...	...	...	...	2.5-7.0	...	4.0	...	...

Lighting Installations in Departments of New Telegraph Building



View Showing Illumination of Commercial News Department in New Offices of Western Union Telegraph Co. in Chicago.



Operating Room in New Offices of Western Union Telegraph Co. in Chicago, Showing Modern Illumination.

Reflection Factors Measured by Absolute Method

Photometer Determines Brightness of Screened Test Spot and Brightness of Unscreened Spot in Sphere to Ascertain Reflection Factor — Paper Before Illuminating Engineering Society

By S. H. SHARP and W. F. LITTLE

Importance of the measurement of reflection factors, particularly factors of diffuse reflection, has long been recognized, and a good deal of work has been done in the field. Until quite recently, however, the matter has been in a rather unsatisfactory state and the values given have been subject to much uncertainty. The introduction of the integrating sphere put at the disposal of photometrists an evident means to use in such measurements, but for the most part measurements so made have been purely relative, that is, they have been expressed in terms of a standard surface the reflectivity of which has been determined by other means, an operation which until recently has not been carried out with a satisfactory degree of precision. For such a service commercial magnesium carbonate block has been extensively used as being a convenient substance and the one which apparently has the highest reflection factor of any ordinary material. Quite generally, too, the value of the reflection factor of this substance has been taken as 0.88 in accordance with data presented by Nutting.

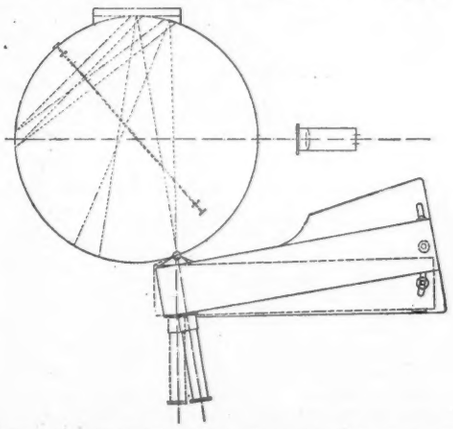
Recently evidence has been accumulating that Nutting's value of reflection factor of magnesium carbonate was considerably too low. For example, Rosa and Taylor* found for Keene's cement, with which the 88-in. integrating sphere at the Bureau of Standards was coated, a reflection factor of 0.92. Benford and Taylor, using methods identical in principle, have found a value for this substance running from 0.97 to 0.99. Benford has shown that by correcting Nutting's original results for the error of his instrument a value of 0.97 is obtained, and Taylor has confirmed his own sphere values by the integration of distribution curves obtained by a point-by-point method. The method used by both of these experimenters is a new one, giving absolute values and depending upon two sets of measurements made with a sphere coated on the inside with the surface to be tested. One set of measurements is made with the sphere complete or nearly complete, and the other with a portion of the sphere removed, whereby the average reflection factor of the interior of the sphere is reduced in a measurable ratio.

An examination of the theory of the sphere has shown that its possibilities in the way of yielding absolute determinations of reflection factors have not been exhausted, but that there remains a still simpler method than Taylor and Benford have used. It shows also that use of the sphere may be extended to take care of the very important practical case, where the reflecting body is not a perfect diffuser, but where it may be anything from a regularly reflecting mirror to a perfect diffuser with any gradation of mixed reflection which may lie between.

*Transactions, Illuminating Engineering Society, vol. II, page 453, 1916.

Theory of Method Used in Determination of Reflection Factor.

If light is projected through a small aperture into the sphere in such a way as to form a small bright spot on its diffusely reflecting walls this spot will give to all the rest of the sphere a uniform brightness; that is, the light flux reflected per unit area over all the surface of the sphere outside of the spot of light will be uniform throughout. If, now, we interpose between the spot of light and a small area on the sphere, at which a brightness photometer looks, an opaque



Arrangement of Photometric Apparatus Used in Measurement of Reflection Factor.

white screen, this screened test spot will receive an illumination from the rest of the sphere which is equal to the brightness of the rest of the sphere. In other words, the flux incident per unit area on the screened test spot will be equal to the flux reflected per unit area by the portion of the sphere outside the test spot and the illuminated spot. Now, by definition, the reflection factor of the test spot is equal to the ratio of its reflected flux to its incident flux, that is, of its brightness to its illumination. Hence, if the photometer observes first the brightness of the test spot when shaded by the screen, and second, the brightness of the sphere wall outside the screened area, the ratio of these two brightnesses will be equal to the reflection factor of the test spot.

More formally stated, if B is the brightness of

the sphere E_s the illumination of a small screened area, and B_s the brightness of this area and r the reflection factor of the test spot, we have:

$$B = E_s, \text{ and } r = \frac{B_s}{E_s} = \frac{B_s}{B}$$

Evidently the portion of the sphere which forms the test spot should be removed so that over the aperture so formed any test sample can be placed, and a convenient arrangement should be introduced whereby the photometer can be rotated slightly so as to look alternately at the test spot and at a nearby portion of the sphere wall outside the screened area.†

If the test sample is a regularly reflecting mirror instead of one with a diffusing surface the photometer will see by way of the mirror an unscreened portion of the sphere surface. The true brightness of this being B, the observed brightness B_s will be rB, where r is the reflection factor of the mirror, and again $r = \frac{B_s}{B}$. It follows that, since under given sphere conditions an observation of the brightness of a test sample, compared with the brightness of the sphere surface, measures the reflection factor alike when the test sample has a diffusing surface and a regularly reflecting surface, such an observation must also give the reflection factor of a sample which gives mixed reflection with any relative amounts of diffuse and regular reflection.

†An alternative arrangement is to substitute for the test sample a piece of metal painted like the rest of the sphere surface and to have the screen within the sphere so supported that it can be moved or rotated out of the way. In practice a plane mirror of known reflection factor may be substituted for the test sample and the brightness of the sphere wall determined by dividing the brightness so observed by the reflection factor of the mirror.

Inasmuch as practically all surfaces with which we have to deal in illuminating engineering give a reflection of this mixed character the last conclusion is of the very greatest practical importance. The procedure outlined therefore gives general solution of the problem of the measurement of reflection factors.

Since the reflection factor of a plane mirror can be measured with high precision on a photometer bar with a point source of light, a ready and most valuable means is at hand to check the findings of the sphere. Inasmuch as only the ratio of photometric readings is involved in the determination of reflection factor, the photometer need not be calibrated but may be so adjusted as to give the best conditions as to color match and scale readings.

Obviously these conclusions are subject to the physical limitations which are necessarily present. For example, no notice is taken of the departure from complete diffusivity of the sphere surface, in the influence of the screen in the sphere, the area which the spot of light covers nor of the area of the apertures necessary for the admission of the beam of light and for the use of the photometer. It is clear that the apertures in the sphere should be as small as possible, as should also the spot of light within the field of view of the photometer and the interposed screen. The size of the screen depends on the size of the spot of light and that of the photometer field. Any increase in the diameter of the sphere used tends to eliminate the influences of these disturbing factors, provided the area of the spot and the photometer field are not increased in the same ratio as the sphere surface. To secure a small light spot with sufficient light to enable good photometric settings to be made requires a projection apparatus adapted to the purpose. To

TABLE SHOWING REFLECTION FACTORS DETERMINED WITH SMALL APERTURE OF PROJECTION LAMP AND SMALL ILLUMINATED SPOT.

Series.	Standard.	Mirror	Magnesium Carbonate 1	Magnesium Carbonate 2	Magnesium Carbonate 3	Milk Glass Polished.	Milk Glass Depolished.	Sphere Surface.
1	0.84	0.82	...	...	0.96	...	0.81	0.765
2	0.84	0.81	1.01	0.98	1.00	0.83	0.81	....
3	0.84	0.81	0.98	0.98	0.99	0.84	0.81	....
4	0.84	0.835	0.95	0.96	0.96	0.835	0.81	....
5	0.84	0.83	0.95	0.95	0.96	0.83	0.82	....
Average	0.84	0.821	0.973	0.968	0.974	0.834	0.812	0.765

TABLE SHOWING REFLECTION FACTOR DETERMINED WITH LARGE APERTURE OF PROJECTION LAMP AND LARGE ILLUMINATED SPOT.

Series.	Standard.	Mirror	Magnesium Carbonate 1	Magnesium Carbonate 2	Magnesium Carbonate 3	Milk Glass Polished.	Milk Glass Depolished.	Sphere Surface.
6	0.84	0.81	1.00	0.99	1.00	0.835	0.805	0.75
7	0.84	0.80	0.98	0.96	0.96	0.82	0.78	...
Average	0.84	0.805	0.99	0.975	0.98	0.828	0.793	0.75

TABLE SHOWING REFLECTION FACTORS DETERMINED WITH DECREASED SPOT OF LIGHT ON SPHERE WALL.

Series.	Standard.	Mirror.	Magnesium Carbonate 1	Magnesium Carbonate 2	Magnesium Carbonate 3	Milk Glass Polished.	Milk Glass Depolished.
8	0.84	0.83	0.99	0.99	1.01	0.81	0.79
9	0.84	0.835	1.01	0.98	0.98	0.84	0.80
Average	0.84	0.833	1.00	0.985	0.995	0.825	0.795
Grand average	0.84	0.82	0.988	0.976	0.983	0.829	0.80

REFLECTION FACTORS DETERMINED BY ABSOLUTE METHOD, COMPARING SCREENED TEST SURFACE WITH UNSCREENED SPHERE SURFACE.

Series.	Standard.	Mirror.	Magnesium Carbonate. 2	Magnesium Carbonate. 3	Milk Glass Polished.	Milk Glass Depolished.
10	0.83	0.813	0.985	0.98	0.815	0.79
			0.985	0.99	0.825	0.785
			...	...	....	0.78
11	0.84	0.842	0.99	0.98	0.84	0.78
					0.85	...
12	0.85	0.80	0.99	0.98	0.825	0.80
13	0.83	0.828	0.985	0.98	0.815	0.77
Average	0.84	0.821	0.987	0.982	0.828	0.784
Grand average	0.84	0.820	0.982	0.983	0.829	0.792

secure a small photometric field the central spot of the Lummer-Brodhun cube should be very small. For a large sphere a telephotometric arrangement might be used; that is, an objective lens might be attached to the ordinary photometer with the cube at or near its focus. Not only should the shading screen be as small as possible, but it should have as high a reflection factor as can be secured. No doubt a mathematical discussion could and should be made which would indicate the magnitude of the corrections involved in any case, but it seems hardly advisable to wait for such an investigation, especially since the data presented indicate that valuable practical results may be obtained with suitable apparatus when such corrections are ignored.

Apparatus Used in Makng Determinations of Reflection Factor.

In investigating the procedure experimentally, such apparatus as was available at the time at the Electrical Testing Laboratories was used. The sphere employed was of copper and was 12 ins. (30 cm.) diam. It was freshly painted so that its interior surface might be as uniform as possible. Light was projected into the sphere by means of a special projection apparatus consisting of an automobile headlight lamp with condenser and objective lenses, all arranged so that the spot on the sphere wall had a diameter of about 1 in. (25 mm.). The photometer used had a Lummer-Brodhun cube with a very small central aperture so that its field of view on the opposite wall of the photometer was about 0.5 in. (13 mm.) diam. The test plate was 90 deg. from the spot of the light, and the photometer was nearly opposite the test plate, its angle of view being about 15 deg. from the normal. This arrangement was chosen so that the points of the sphere wall observed by the photometer, either when viewing a spot near the test surface or one on the opposite sphere wall, as is done when the test surface is a mirror, would be nearly symmetrically placed with respect to the spot of light. A small screen between the spot of light and the test surface was fastened to a slender rod with the end projecting so that the screen could be turned out of the way of the beam of light if so desired.

A number of surfaces were tested including blocks of magnesium carbonate, a plane glass mirror, and a surface of milk glass roughened and standardized at the Bureau of Standards by Taylor's methods. The value given by the bureau for its reflection factor coefficient is 0.84. The mirror was caretully standardized by repeated measurements on two different photometer bars, and the average value for its reflection factor was found to be 0.83. A difficulty experienced, particularly in the earlier stages of the work, was in getting sufficient light in the sphere to enable good photometric settings to be made. During the later stages of the work the opening in the diaphragm admitting light, which at first was only 6.5 mm. diam., was increased to 10 mm., whereby the photometric conditions were materially improved. The test results are summarized in the accompanying tables.

A procedure has been worked out and described whereby the reflection factor of any surface, whether mat or glossy, may be measured by an absolute method. The results may be checked by the use of a calibrated plane mirror. The test results confirm the validity of the method. Further theoretical or experimental work, however, is necessary in order to determine precisely the best conditions as to size of sphere, lighting arrangements, photometric arrangements, etc., for obtaining the highest precision in the use of this method, but for ordinary industrial purposes its validity is sufficiently proven by the test results given. The fact that measurements can be made on very small samples is an advantage of considerable importance in work of this character.

The values for the reflection coefficient of commercial magnesium carbonate block are in general agreement with those of Benford and of Taylor. As good an average value for this substance as, in view of its variability, it is practicable to fix, would seem to be not far from 0.98, and it is suggested that tentatively at least this value be adopted. Reflection factors determined by relative methods based on Nutting's value for magnesium carbonate as a standard have evidently been too low, but they may readily be corrected to correspond to the suggested value for the standard by multiplying them by the fraction 98/88.

PREHEATED AIR FOR BURNING FUEL.

The use of preheated air for the burning of coal, coke, oil and gas is general in the iron and steel industry, where the "hot blast" is applied to all kinds of furnaces. In England considerable work along this line is being done by the Underfeed Stoker Co. Many installations on shipboard have proved practicable and economically successful. From the economical point of view the advantages of the system for land boilers are obvious. It returns to the furnace a definite amount of heat and it facilitates combustion, the result being a higher temperature with its consequent increased efficiency. Each case presents its own problem; but, in general, any plant where there is plenty of steam for heating the feed water and coal is high in price, an air heater will effect a sufficient saving to warrant its installation. A combination which, in many cases, will work out satisfactorily is a comparatively small economizer with an air heater of sufficient size to bring the gases down to 300 deg. F.

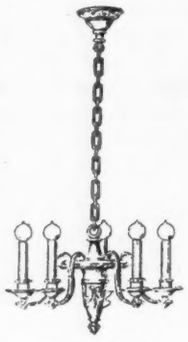
EMPLOYES SUBSCRIBE TO WESTERN ELECTRIC BONDS.

Western Electric Co. employes to the number of 6170 have taken advantage of the plan and its extension, which was announced recently, to permit them to purchase the new 5-year, 7% convertible gold bonds issued by the corporation. They have subscribed for a total of over $2,600,000 worth of the securities. The figures show that about one employe in every six is buying the bonds, the average subscription being about $425. All members of the Western Electric Co.'s personnel who had been with the corporation at least 6 months on Dec. 1 were eligible to buy the bonds. Payment is being made on the installment plan by deductions from pay, requiring about 23 months to complete the payments.

Various Styles and Modifications in Period Lighting Fixtures

Dutch Influence

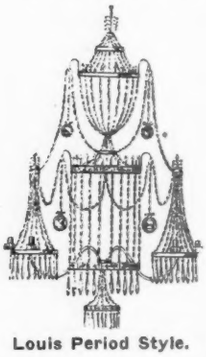
Adam (Modern).



Empire (Modern).

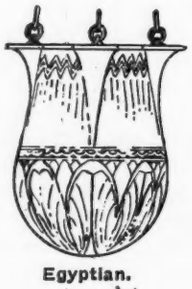
Hepplewhite.

Colonial (Modern).

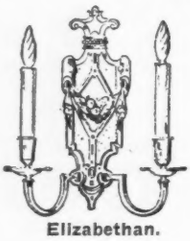


Louis Period Style.

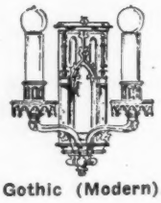
French Renaissance Influence.



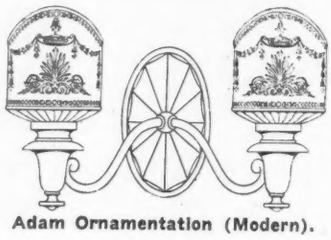
Egyptian.



Elizabethan.

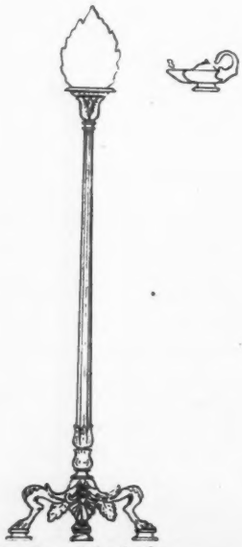


Gothic (Modern).



Adam Ornamentation (Modern).

Gothic.



Grecian Adaptation

Adam (Special).

L'art Nouveau.

Period Lighting Fixture Designs Appeal to Esthetic Taste

Artistic Types of Chandeliers to Match Decorative Scheme of Each Room—Must Be Selected with Care to Avoid Incongruities —Solution of Problem to Eliminate Poor and Unsightly Units

Despite the fact that the preponderance of trade in household lighting fixtures is today, and will continue to be in the future, confined to standard modern types, this is also the day of the "period" in household decoration, particularly in the homes of the wealthy. Those who can afford the luxury are seeking special designs in "period" lighting fixtures to match the decorative trim of their rooms. Architects, decorators, designers of furniture, lighting fixtures, wallpaper and floor-covering patterns, window and door hangings, bookbindings, etc., range from Italian Renaissance to Early Venetian, while the art principles of the early Jacobean masters, Chippendale or Sheraton, are being wrought in articles of household plenishing those worthies never dreamed of. It is a very wonderful modern development, good for everybody who will take the trouble to post himself on periods and what they mean. It has sounded the death-knell of the hodge-podge and the abortions that in previous days were foisted on the undiscriminating public by over-ambitious manufacturers.

In other words, the esthetic side is getting more attention in America than ever before. Line and form, proportion and color mean a good deal more to the average customer of the lighting-fixture dealer than they did to his father. He is getting art in the schools, the home magazines, absorbing it from the shop windows and the public buildings. Good taste grows by what it feeds on; not that all people buy understandingly, but they do buy with more or less feeling. They may buy a fixture today and take it home, thinking that they have what is appropriate and desirable. But unless it is the correct one, sooner or later they are going to reach that conclusion. They may not be able to tell what is the matter with it, but they will feel that something is wrong and that will influence them in a degree against the house from which they bought.

There are two practical angles on this proposition for the lighting-fixture dealer. In the first place, he should familiarize himself with "periods." It is not as difficult as might appear. Each period has its distinctive decorative motifs and more or less distinctive structural forms, which, once understood, will always be remembered. Any public library has books which wi start the student on his exploration and many of the catalogs of the manufacturers are textbooks in themselves. Once started on this study the fixture man will find himself absorbed and fascinated. Then he will be better able to make the two practical applications of his knowledge that are suggested here.

One is that the period appeal is to those who, as a rule, are best able to indulge their desires in this direction. Either that, or the customer will be represented by a professional decorator, who, while keen for the best price possible, still wants good decorations. The well-posted fixture salesman can not only save time after he finds out the direction in which the customer's preferences run, but by sympathetic handling he will often be able to increase the bill of sale to an enthusiastic devotee of a particular period. Occasionally there will be poor people who make studies of art in household directions, but for the most part this study is taken up by the well-to-do. When they come to "do over" their homes or to build new ones, they begin a study of architectural and period styles. Somebody in the family is pretty sure to become an enthusiast; then the dealer can push his highest priced fixtures of the same order with a good chance of making sales. Many of these period enthusiasts will most likely want conformity. In such a case the dealer who would try to interest a customer in an ornate Florentine wall bracket lamp, when that customer is building a severely classical Adam house, would not only waste his time, but might very possibly lose the confidence of the customer.

Origin of Period Styles and Effect on Modern Decoration.

Of course, a beautiful thing of one period may not go well with a beautiful thing of another period. Both of them are true to the laws of design. No dealer would think of suggesting a green iron wall bracket for a French drawing room, but to many a customer mixing the classic and the rococco is just as serious an error. This brings the second application to the front. To appeal to this discriminating trade by inciting its esthetic appreciations (and at the same time this does not diminish the appeal to those who are not educated) it is very desirable to observe the period properties in the displays.

In a broad sense the appearance of a lighting fixture is of secondary importance. This does not mean that artistic design or period style should be neglected, for any element, however insignificant, must receive proper attention if the final result is to be harmonious. The intricacies of the artistic aspects of lighting fixtures cannot be fully discussed in a few pages, for the evolution of the various styles and their modifications and modulations leads from the roots of racial and national characteristics through the intricate branches formed by the fluctuations of the fortunes of nations. Superposed upon all these are the influences of rich or powerful or creative individuals, of increasing scientific knowledge, of new light sources, and of manufacturing and commercial experiences. Indeed, the whole is a complex web whose unraveling would lead far afield; however, a view of the high lights should

be helpful to the householder.

The architect and the decorator meet with no difficulties in this field; in fact, we criticize their past efforts chiefly because their attention has been concentrated so powerfully upon period style, the artistic design and the appearance of lighting fixtures that they have not looked far beyond them to see the wonders of light as an expressive medium.

One of the earliest periods which is reproduced today is the Egyptian. The oil lamp, with its open flame, was the lighting device of the early Egyptian centuries. Ancient tombs, early writings and the relics of ancient China, of India, of early Greece, and of the Roman Empire show the oil lamp to have been the chief source of light. Naturally, it influenced the mechanical features of the early fixtures, but the ornamentation was always national or powerfully individualistic in character.

In fixtures of this period the shallow oil lamp may be a motif and the typically early Egyptian ornamentation will denote its period style. On the other hand, the oil lamp need not figure in the design, but ornamentation may serve to make the fixture of Egyptian style. Of course, the oil lamp may also be a motif in a fixture of the classic Greek periods, but the ornamentation will be typical of the days when Greece was a creative spirit in art.

It is commonly conceded that several centuries before the beginning of the Christian era the Greeks developed their decorative art to a perfection which has never been excelled. It is a fundamental of much of the decorative art of later centuries and it has inspired artists of many countries up to the present time. This early Greek period is still alive and a "modern" fixture in an interior done in Greek period style is such a capital offense against the laws of esthetics that it seems unnecessary to mention the possibility. Still, such incongruities are to be found without engaging in a strenuous research.

The Roman Empire arose in its might during the early centuries of the Christian era. The lamp and torch were still the chief devices of lighting and they became beautiful objects under the influence of the grandeur of the empire. The charming simplicity of Grecian ornament was blended with the Roman magnificence and we find the ornament of the Roman period to vary considerably according to the Grecian influence.

Our liking for the antique is reflected in the modern lanterns in use today in halls, vestibules and entrances. These may be patterned after those of the classic periods or they may be similar to the old lanterns of iron carried by watchmen a few centuries ago. In the former case the old oil lamp is equipped with a small incandescent lamp to replace the wick, and, in the case of the lantern, glass is substituted for horn and the modern lamp has replaced the tallow candle or smoking oil wick. These substitutions must be made with care or the result may be incongruous.

As we look over a display of fixtures which are intended for the home we are often struck with the meaningless combination of stock parts in many fixtures which are supposed to be "high grade." Such objects cannot endure. They will tire the householder eventually when it dawns upon him that they are meaningless to the point of barbarism. There is an intangible quality to artistic objects which outlasts centuries.

RESEARCH ASSISTANTSHIPS OPEN IN EXPERIMENT STATION.

Two Years' Work With Pay Entitles Research Assistant to Degree of Master of Science in Particular Branch of Work Followed.

To assist in the conduct of engineering research, and to extend and strengthen the field of its graduate work in engineering, the University of Illinois maintains 14 research graduate assistantships in the engineering experiment station. Two other such assistantships have been established under the patronage of the Illinois Gas Association. These assistantships, for each of which there is an annual stipend of $600 and freedom from all fees except the matriculation and diploma fees, are open to graduates of approved American and foreign universities and technical schools who are prepared to undertake graduate study in engineering, physics or applied chemistry.

An appointment to a position as research graduate assistant is made and must be accepted for two consecutive collegiate years, at the expiration of which period, if all requirements have been met, the degree of Master of Science will be conferred. Not more than half of the time of a research graduate assistant is required in connection with the work of the department to which he is assigned, the remainder being available for graduate study. Nominations to these positions, accompanied by assignments to special departments of the engineering experiment station, are made from applications received by the director of the station each year not later than March 1. The nominations are made by the executive staff of the station, subject to the approval of the president of the university. Nominations are based upon the character, scholastic attainments, and promise of success in the principal line of study or research to which the candidate proposes to devote himself.

The engineering experiment station, an organization within the college of engineering, was established in 1903 for the purpose of conducting investigations in the various branches of engineering and for the study of problems of importance to engineers and to the manufacturing and industrial interests of the state of Illinois. Research work and graduate study may be undertaken in architecture, architectural engineering, ceramic engineering, chemistry, civil engineering, electrical engineering, mechanical engineering, mining engineering, municipal and sanitary engineering, physics, railway engineering, and theoretical and applied mechanics. The work of the engineering experiment station is closely related to that of the college of engineering, and the heads of departments in the college constitute the executive staff of the station. Investigations are carried on by members of the station staff and also by members of the instructional staff of the college of engineering. Additional information regarding this work may be obtained by addressing the director of the engineering experiment station at Urbana, Ill.

Lighting Fixture Market Directory of Exhibitors

Who They Are and What They Will Display—Men Who Will Have Charge of Booths—Lighting Units, Fittings and Everything for Modern Illumination Will Be Found in the Big Exposition

Buffalo will be the "Mecca" for the lighting fixture industry next week on the occasion of the annual convention and fixture market to be held under the auspices of the National Council of Lighting Fixture Manufacturers. Three conventions are scheduled for the period from Feb. 14-19, when the Lighting Fixture Dealers' Society of America, the Illuminating Glassware Guild and the National Council of Lighting Fixture Manufacturers will gather to discuss problems peculiar to their particular branch of the industry. The exhibits will be displayed in the Elmwood Music Hall. The names of the exhibitors, product manufactured and the number of the space they will occupy are enumerated below:

Lightolier Co., New York City, will display in booths 1 and 2 a complete line of lighting fixtures of its own manufacture, and an imported line consisting of French bronzes, crystal fixtures, etc. The booths will be in charge of J. X. Netter, advertising manager, and Max Blitzer, sales manager. Headquarters of the Lightolier delegation will be at the Lafayette Hotel.

William R. Noe & Son, New York City, manufacturer of lamp chimneys, will display its wares in booth 3.

Perfeclite Manufacturing Co., Seattle, Wash., will display in booth 4 its "Perfeclite" electric lighting units, confining the line to the commercial and industrial types. An exhibit will be made of the "Perfeclite Aladolamp," and a special showing of the portable type of "Perfeclite" fixtures known to the trade as type A. P. and type C. P., burning 100-watt lamps. A further display will be made of the new line of "Perfeclite" fancy wall brackets. The exhibit will be in charge of J. L. Jaffe, general manager, assisted by C. L. J. Smith; Carl H. Heide, of the First National Lighting Corp. of Cleveland, and J. B. Williams, Columbus representative of the latter company.

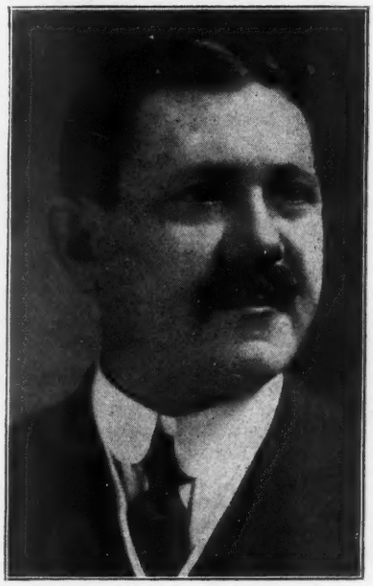
M. Eisenberg, New York City, will exhibit his product in booth No. 5.

Colonial Chandelier Works, New York City, will display its line of direct lighting fixtures in booth 6.

H. Northwood Co., Wheeling, W. Va., manufacturer of table glassware, etc., will occupy booth 7 with its line of material.

Gillinder Brothers, Port Jervis, N. Y., will exhibit their line of illuminating glassware in booths 8 and 71, which will be in charge of Orton E. Jenne, William Reed, Henry Froelich and Edwin B. Gillinder.

Highlands Manufacturing Co., Muncie, Ind., manufacturer of the "Reth-Flex" line of lighting fixtures and portable lamps, will have on display in booth 9 samples of its "Etrurian" and "Nippon" design of metal boudoir lamps with decorated shades, in different finishes such as white and blue, white and pink and the bronzes. The company will also show samples of its library lamps in the new designs carrying 16- and 18-in. decorated domes, the bases being finished in the "Patina" and "Highlands" bronzes. A sample line of the company's standardized ceiling-type lighting fixtures, residential lighting fixtures in the ivory and gold, statuary and flemish bronzes, together with several specialties of interest in residential as well as commercial lighting will also be on display. The exhibit will be in charge of Fred J. Vlaskamp, assistant sales manager.



Joseph Sable, President Phoenix Light Co.

Gleason-Tiebout Glass Co., Brooklyn, N. Y., has reserved booth 10 for its "Gletieco" line of glass specialties.

National Chain Co., College Point, L. I., manufacturer of chandelier chains, will exhibit its product in booth 11.

Biddle Gaumer Co., Philadelphia, manufacturer of brass castings, etc., will occupy booth 12 with its line of lighting fixtures.

Reliance Metal Spinning & Stamping Co., Brooklyn, N. Y., will exhibit its line of metal specialties and shells for electric and other fixtures in booth 13.

Scott-Ullman Co., Cleveland, will display its direct and semi-indirect lighting fixtures in booth 14.

Star Glass Co., Star City, W. Va., will be located in booth 15 and its exhibit of illuminating glass will be in charge of J. E. Shepherd, sales manager.

Art Metal Manufacturing Co., Cleveland, will display its "Amco" lighting units in booth 16. The company claims that these units eliminate the glare while retaining all the efficiency of the bare lamp.

Universal Metal Spinning & Stamping Co., Brooklyn, N. Y., manufacturer of shower plates, canopies, ceiling lights and various parts pertaining to lighting fixtures, will occupy booth 17.

L. Beyer & Co., Cleveland, manufacturer of lighting fixtures for dealers exclusively, will occupy booth 18, in charge of L. Beyer.

Empire Stamping & Metal Spinning Co., New York City, will exhibit its lighting fixture parts in booth 19.

Mazzolini Art Craft Co., Cleveland, will exhibit its wood fibre composition in booth 20.

Alt-Le Lighting Fixture Co., New York City, will be represented with an exhibit in booth 21.

United Metal Spinning Co., Brooklyn, N. Y., will display a complete line of electric and other fixture parts in booth 21½, which will be in charge of R. Kasher, president, who will be assisted by E. R. King, general manager, and Joseph H. Steinberg.

L. Kronenberg & Co., Cleveland, will display its product in booth 22.

Jeanette Shade & Novelty Co., Jeannette, Pa., manufacturer of glassware, will occupy booth 22½.

Lincoln Manufacturing Co., Detroit, manufacturer of lighting fixtures and parts, will display its product in booth 23.

Frankel Light Co., Cleveland, manufacturer of electric fixtures and lighting supplies, will occupy booth 24, where a good part of the company's line of fixtures and several new articles such as its fixture hand-press will be exhibited. The company also plans showing two or three new finishes that it is just placing on the market. Dave Frankel and E. J. Rueth, sales manager, will be in charge of the display.

Duplex Lighting Works of General Electric Co., New York City, will occupy booths 25 and 26, where "Duplexalite" units will be on display.

Macbeth-Evans Glass Co., St. Louis, will occupy booth 27 with an exhibit of its glassware.

St. Louis Brass Co., St. Louis, will exhibit its product in booth 28.

New Era Appliance Corp., New York City, will be located in booth 29, where an exhibit of its lighting fixtures, brass goods, supplies and metal novelties, in charge of James Reitzes, will be displayed.

Henrik Moe, President Moe-Bridges Co.

Thomas Day Co., San Francisco, will occupy booth 30 with an exhibit of its lighting fixtures.

New York Lighting Fixture Co., New York City, will have a display of its lighting units in booth 31.

Phoenix Glass Co., Pittsburgh, will be represented in booth 32 with an exhibit of glassware.

Phoenix Light Co., Milwaukee, will exhibit chandeliers and portable lamps made of brass and star metal, displaying nine samples out of over 1100 designs shown in its catalog. These goods are distributed to every state in the Union from warehouses located at several convenient points throughout the states. The Phoenix line, which will occupy booth 33, is made entirely in the company's establishment from the original casting to the glass bending. The exhibit will be in charge of J. Sable, president; N. Berger, superintendent; J. Rodems, treasurer, and A. G. Nygren, sales manager.

Sulzer & Co., Inc., Philadelphia, will display its line of lighting fixtures in booth 34.

Moe-Bridges Co., Milwaukee, will occupy booth 35 with an exhibit of representative pieces of its line of electric lighting fixtures, including both ceiling fixtures as well as brackets. A feature of the exhibit will be a demonstration of the company's "Feltpakt" system for packing fixtures so as to protect them to withstand the hard knocks of transportation, thereby delivering them in good condition to the customer. The Moe-Bridges exhibit will be in charge of Henrik and O. E. Moe and C. A. Bridges.

C. A. Bridges, Vice-president Moe-Bridges Co.

Art Lighting Fixture Studios, Buffalo, N. Y., will be represented with an exhibit in booth 36.

Mohrlite Co. of America, Nashville, Tenn., will display in booth 37 its line of total-indirect and semi-indirect lighting units, ceiling types as well as wall-brackets. The exhibit will be in charge of L. G. Boxwell, vice-president.

Horn & Brannen Manufacturing Co., Philadelphia, manufacturer of lighting fixtures, will exhibit its product in booth 38.

Kayline Co., Cleveland, manufacturer and designer of electric and other combination fixtures, will occupy booth 39 with an exhibit of chandeliers, brackets and candelabras. R. G. Roberts, sales manager, will be in charge of the display.

Beardslee Chandelier Manufacturing Co., Chicago, manufacturer of a complete line of chandeliers for every lighting requirement, will display its "Denzar" lighting unit in booth 40.

Jefferson Co., Follansbee, W. Va., will be represented with an exhibit of its product in booth 41.

Morreau Co., Cleveland, manufacturer of electric and other lighting fixtures, will occupy booth 43.

Crown Electrical Manufacturing Co., St. Charles, Ill., will exhibit its product in booth 44.

Jefferson Glass Co., Follansbee, W. Va., will display a diversified line of plain, etched and decorated illuminating glassware in its booth 45, which will be in charge of A. L. Brunn, assisted by S. E. Wiedemer.

Holophane Glass Co., New York City, manufacturer of reflectors for every lighting purpose, will display its units in booth 46.

Novelty Lamp & Shade Co., Cleveland, will occupy booth 47 with a display of its products.

Falkenbach Manufacturing Co., New York City, manufacturer of electric and other fixtures, will be represented in booth 47½.

St. Charles Fixture Manufacturing Co., St. Charles, Ill., will be represented in booth 48 with a suitable exhibit of its fixtures.

Empire Lighting Fixture Co., New York City, will display its line of electric fixtures in booth 48½.

Virden Co., Cleveland, will show a complete line of fixtures, fixture parts, brass spinnings and stampings in booth 49, which will be in charge of J. C. Virden, Jr., and R. L. Shrimplin.

O. E. Moe, Manager Sales and Advertising, Moe-Bridges Co.

Dallas Brass & Copper Co., Chicago, will be located in booth 50, where an exhibit of lighting fixtures and parts will be displayed. The booth will be in charge of Paul G. Drebes.

E. N. Riddle Co., Toledo, O., manufacturer of lighting fixtures, will have an exhibit in booth 51.

Max Schaffer, New York City, will display his line of lighting fixtures in booth 52.

Lion Manufacturing Co., Brooklyn, N. Y., will occupy booth 54 with an exhibit of its lighting fixtures.

Ivanhoe-Regent Works of General Electric Co., Cleveland, will exhibit a complete line of its illuminating glassware as manufactured for the home

and for commercial lighting purposes. For commercial lighting the "Ivanhoe Ace," "Ivanhoe Trojan," and the recently developed "Ivanhoe Keldon," will be displayed. Besides these units there will be a showing of "Sudan" and "Druid" glass reflectors for certain classes of commercial lighting. The home lighting display will consist of the "Crystal Rozelle," "Ivre Rozelle," "Veluria Rozelle" and "Ivre Etched" glass, now shown in the company's catalogs, with the addition of several shapes and designs which have not, as yet, been catalogued. Among these is a new bedroom set just now being placed upon the market. This set consists of pendant and upright shades in shapes and color designs especially suitable for bedrooms, but also suitable for other rooms and for other purposes where their subdued colorings may be found appropriate. The color designs are plain parchment, and morning-glory with parchment background. The "Ivanhoe Ivandine" will also be displayed. This is a unit made in three "Rozelle" color designs and one etched design, which is manufactured especially for better dining room lighting. In the industrial line only the "RLM" dome reflector and the "Ivanhoe" glass-top reflector will be exhibited. The Ivanhoe-Regent Works display will be in booth 57 and will be in charge of Messrs. Swindel and Reddick.

Mutual Lamp Manufacturig Co., New York City, will occupy booth 58 with its line of lamps.

Brandt-Dent Co., Watertown, Wis., will exhibit its line of lighting fixtures in booth 59.

Bauman & Loeb, New York City, will have on display in booth 60 a line of electric lighting fixtures suitable for every purpose.

Bridgeton Chandelier Co., Bridgeton, N. J., will exhibit its line of chandeliers in booth 55.

Handel Co., Meriden, Conn., has reserved booth 53 for its exhibit of library, floor, boudoir and desk lamps and also lighting fixtures. The booth will be in charge of J. A. Roberge.

Hocking Glass Co., Lancaster, O., will be located in booth 56, where its line of glassware will be exhibited.

Cassidy Co., Inc., Long Island City, N. Y., will occupy booth 61 with a display of "Cas-O-Lux" fixtures, portables and unit lights. The exhibit will be in charge of W. R. M'Coy, sales manager.

L. Plaut & Co., New York City, manufacturer of lighting fixture specialties and glassware, will exhibit its products in booth 62.

Peerless Light Co., Chicago, manufacturer of "Peerlite" lighting supplies, will occupy booth 63.

Eagle Manufacturing Co., Wellsburg, W. Va., will exhibit its glassware specialties in booth 64.

Gaites, Peace & Co., Inc., Brooklyn, N. Y., will be located in booth 65, where residential lighting fixtures will be on display. The exhibit will be in charge of J. M. Ehrlich.

C. G. Everson & Co., Chicago, manufacturer of lighting fixtures, will exhibit in booth 67.

Fibreduro, Inc., New York City, designer and manufacturer of artfibre productions, will be represented in booth 66.

Kramer Bros. Lamp Co., New York City, will exhibit its product in booth 68.

R. Williamson & Co., Chicago, will display its lighting units and standard residential line of fixtures and several special pieces in booth 69. Its exhibit will be in charge of A. J. L'Ecuyer, sales manager.

Oscar O. Friedlander, Inc., New York City, will exhibit its line of lighting fixtures in booth 70.

Crown Chandelier Co., New York City, will occupy booth 71½ with its line of chandeliers.

Moran & Hastings Manufacturing Co., Chicago, will display in booth 42 some new creations in lighting effects for residence lighting, which will be entirely different from the ordinary run of designs. The company will exhibit nine hanging fixtures, including

Franz Brzeczkowski, President Moran & Hastings Manufacturing Co.

hall lantern effects, living room and dining room chandeliers, as well as ceiling lights. In addition there will be about eight brackets that will correspond and harmonize with the hanging fixtures shown. There will also be displayed the ornamental type of the company's commercial unit known under the trade name of "Raymo." The booth will be in charge of Franz Brzeczkowski, president, and Howard C. King, manager.

Star Chandelier Co., Inc., New York City, manufacturer of electric lighting fixture specialties, will exhibit its line in booth 72.

Incandescent Supply Co., New York City, manufacturer of lighting fixtures, will be represented in booth 72½.

Friedley-Voshardt Co., Chicago, manufacturer of copper lanterns and other specialties, will exhibit its line in booth 73.

Acme Lighting Fixture Co., New York City, will display its direct and semi-indirect fixtures in booth 74.

National X-Ray Reflector Co., Chicago, will show in booth 75 its line of X-Ray indirect lighting fixtures. The exhibit will be in charge of E. C. McKinnie, manager of the fixture department.

Wahle & Francois, New York City, manufacturers of lighting fixtures, will display their product in booth 76.

Chicago Lamp & Fixture Co., Chicago, will occupy booth 78 with its line of specialties.

Parch-O-Lite Co., Chicago, will display its product in booth 79.

Good Furniture Magazine, Grand Rapids, Mich., will be represented in booth 84.

Electrical Review, Chicago, will occupy booth 85.

Electrical Merchandising, New York City, has reserved booth 86.

New Color Science Center, New York City, will exhibit in booth 87.

Aladdin Manufacturing Co., Muncie, Ind., will be represented in booth 90.

Champion Brass Works, Coldwater, Mich., manufacturer of brass and copper rivets, brass, bronze and aluminum castings, iron and brass chain, will show in booth 92 a line of cast brass arms, fancy loops and the "baby loop." In addition to this some half a dozen new items will be displayed which will be of interest to the fixture trade. The exhibit will be in charge of F. E. Chambers, president and sales manager.

Electrical Record, New York City, will be represented in booth 93.

Pennsylvania Glass & Manufacturing Co., Pittsburgh, will display its glassware and other specialties in booth 94.

Edward Miller & Co., Meriden, Conn., will display in booth 95 its line of lighting fixtures and brackets suitable for residences; also portables and floor lamps. The exhibit will be in charge of J. W. Maskell, manager of the fixture department.

Shapiro & Aronson, Inc., New York City, manufacturer of lighting fixtures, will display its "S. & A." line in booths 96 and 97.

National Metal Spinning & Stamping Co., New York City, will display its lighting fixture specialties in booth 98.

Robert Findlay Manufacturing Co., Inc., New York City, manufacturer of lighting fixtures, will occupy booth 99.

Pass & Seymour, Inc., Solvay, N. Y., manufacturer of electric wiring devices, will be represented in booth 100.

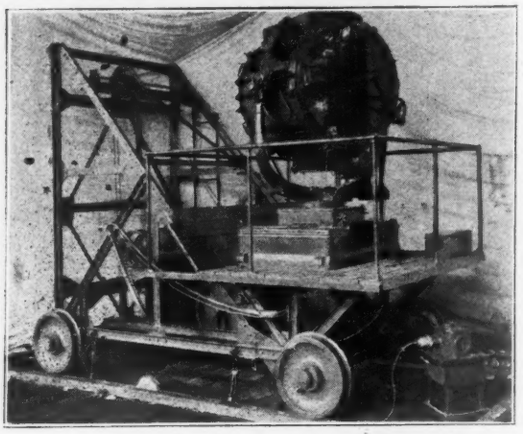
Bryant Electric Co., Bridgeport, Conn., will display its line of electric wiring specialties in booth 101.

Cowan Electric Co., Chicago, has reserved booth 102 for exhibiting its product.

ELEVATING SEARCHLIGHTS OPERATED AT GREAT DISTANCE.

Select Materials and Skillful Work Required for Four Rotating Lamps Which Will Illuminate Harbor in the Dutch East Indies.

America's mastery of coast defense problems is reflected in a certain shipment now going forward from a large American manufacturing plant to the island of Java, Dutch East Indies. Four



Searchlight Lowered for Transportation or Concealment.

military searchlights, among the most powerful of their kind ever made, and showing several variations from type, are to provide the far-seeing night eyes of an island seaport. Searchlights such as these, some of them considerably larger, are located at many points along the coast line of the United States. They run in size to the immense 60-in. units that will throw a beam of 500,000,000 candlepower. The American type, highly developed in every respect, has been one of the outgrowths of the American coast-defense problems, and other nations with coast points to defend are evidently willing to give credit to American ingenuity along this line. The colonial department of the government of the Netherlands brought this particular problem to this country, and the problem seems to have been satisfactorily met.

The four searchlights, each rated at 300,000,000 candlepower, were designed by Dutch engineers and engineers of the General Electric Co. at Schenectady, N. Y. The first steps in the matter were taken by the Dutch government authorities in 1914, but the war interfered with the project before the order for the searchlights had been officially placed. As soon as the world conflict ended the order was placed and the construction of the searchlights has just been completed.

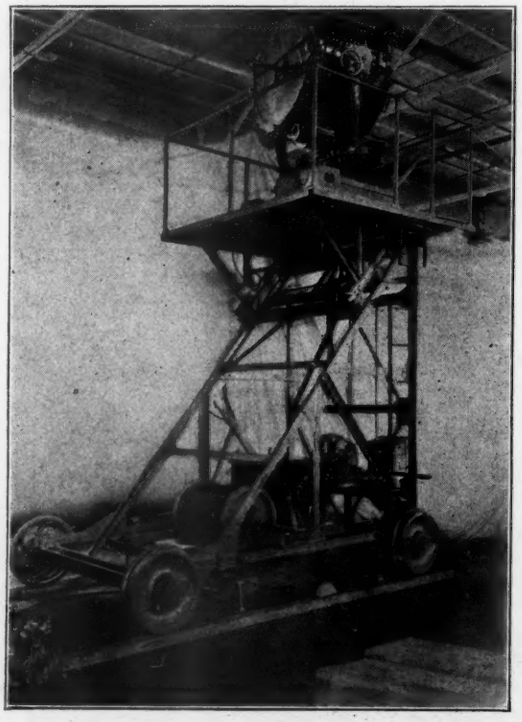
Operator Controls Searchlights From a Distance.

Each unit carries a lens 36 ins. diam. and requires a current of 150 amperes. They are to be located on four sides of a promontory. The light from each, traveling in a sector of 90 deg. will enable the whole battery of searchlights to illuminate the surroundings in every direction. By the elevation of each searchlight on an inclined plane of 45 deg. the element of military safety is taken into account. The searchlights are mounted on trucks which run on an inclined plane built of structural steel, and when dropped to the lower position the entire apparatus is screened from view by a parapet.

Like most searchlights of their style these can be controlled from a distance. The observer who operates the light beam can be 1000 ft. away, if desired, and throw on or shut off the beam, swing it to any point around the sector, or raise or lower the apparatus by merely pressing buttons. He will have complete control of the equipment without even seeing it. The power apparatus, which will be located in a bomb-proof shelter at the base of the hill, consists of four 25-kw. gasoline-electric generating sets.

Armies and navies have long been dependent upon such equipment, but searchlights have their place also in the pursuits of peace. Coastwise shipping, ferries and pleasure craft all use them in one size or another. They are helpful to the advertising man, are responsible for scenic effects at carnivals, and are employed to increase the beauties of nature like Niagara Falls. Ordinarily they are used to a larger extent on sea than on land.

Much skillful labor goes into a searchlight. The lamp alone often consists of 1000 different pieces, all most delicately adjusted. Practically all the material used must be noncorrosive owing to exposure to the weather and the delicacy of the parts. Gold, silver and platinum all enter into the apparatus, as well as the more common metals. The iris shutter, which screens or exposes the lens at the pressure of a button in the operator's room a mile or more away, is made of brass scales that overlap in a rotating motion. The lens is made of glass of varying thickness—9/16 in. in the 60-in. lights, and ¼ in. in the 18-in. apparatus.



Searchlight Built to Produce a Beam of 300,000,000 Candlepower.

EDITORIAL COMMENT

Buffalo Lighting Fixture Market

"The lighting fixture business has arrived at the parting of the ways," said a prominent fixture manufacturer the other day. "In the development of illuminating facilities, from the ancient period of the oil and rush light to the present modern equipment, we have been steadily climbing a trail up a high mountain of progress. It is to be determined at the Buffalo Fixture Market whether we will stop at the summit of this mountain and build higher and more substantially, or take the downward trail on the other side."

This manufacturer seems to feel that the perfection of illumination by electricity is about to reach a point beyond which finer development would be unnecessary. Perhaps he is right. The question now is to maintain this development at its present high level, by devoting every energy to creating the universal demand necessary to place modern illumination in every home, factory and business office, and extend its economic convenience to all outdoors—even to the acres of the agriculturist. For this achievement more intensive salesmanship will be required.

As the result of the late war the business of making and selling lighting fixtures was allowed to stagnate, chiefly because the industry was considered non-essential and the fixture factories were required to turn for the time to the fabrication of munitions or other necessities. Lack of standardization, lack of easily removable fixtures and the fact that most fixtures were installed by landlords who selected them according to the price rather than with taste and value of proper illumination, were chief among the factors contributing to the period of stagnation. Many fixture dealers succumbed to the situation and carried a small assortment, poorly displayed, because occasional customers had to have some kind of fixtures when they changed from oil lamps or gas to electricity, or had built a home of their own. Having had little or no experience in selecting lighting fixtures, and probably no informative sales talk or literature on the subject, the average customer was glad to take whatever fixture the dealer handed him, the dealer in the meantime often being as ignorant as the customer of the latter's actual requirements.

One of the most important problems to be solved at the Buffalo Fixture Market is, therefore, the question of the best methods of merchandising fixtures. A study of this problem will involve the question as to whether it is better to teach present fixture dealers new and more intensive methods of fixture salesmanship or to organize staffs of trained specialists to handle the business. That the business will not be permitted to retrograde is the positive attitude of the progressive manufacturers. In the face of modern development and the great achievements of the electrical industry, particularly in the field of illumination, no branch of business activity today presents greater possibilities for growth and prosperity than that of merchandising lighting fixtures.

Quality in Lighting Installation

The general public has little ability to judge of quality of work or material in a lighting installation. Unless his judgment be guided by expert advice, the average owner of a building will be satisfied with an equipment which enables the lamps to burn and whose visible parts have a good finish. Consequently, when contracts are being considered, his decision is likely to be principally influenced by price.

It is necessary for the electrical contractor who wishes to do first-class work, consequently, to talk quality to the prospective customer, and to acquaint him with the possible differences in the character of the electrical work which is to be installed. The proper time to talk quality is before a bid is made; in fact, before the specifications are drawn up, if this be possible. The contractor should insist upon plans and specifications which will indicate clearly the character of work and the quality of material which is desired. Otherwise the man who intends to do high-grade work with good material will find himself hopelessly out of the running with the unscrupulous contractor. Even where specifications are clear, it is highly desirable that reputable contractors should refuse to bid against irresponsible ones, since the latter will almost always bid upon the basis of skimping the job and getting away with it.

In the long run, a contractor with a reputation for low prices is not likely to prosper. His dealings are principally with those who have no appreciation of good work and who let their con-

tracts on the basis of price alone. It is necessary for him to use inferior materials and a low grade of workmanship, since he must compete with the worst element among his competitors. He finally gains a reputation for poor work and this makes it almost impossible for him to afterwards get any job at a good price. On the other hand, the contractor who achieves a reputation for good work will be sought by people who recognize this fact and are willing to pay a fair price for a high-grade installation.

There are difficulties, of course, in making a stand for first-class work and refusing to do any other kind. Many contracts will be lost, and the path may not be an easy one while a reputation is being achieved. Earnest effort will be required in perpetually talking quality and convincing customers that the best, or at least, good material and workmanship are the cheapest in the long run, even where the difference is not immediately discernible in the completed job. The contractor must not only talk quality, but he must think it, and put it into his work. He must educate his customers to want it and to insist upon getting it.

The difficulties are lessened when the high-grade contractors in any community co-operate in spreading the gospel of quality and in refusing to bid on jobs where price is the only consideration.

Convenience Outlets in Homes

In many houses and apartments, even those of the better and modern type, an insufficiency of outlets usually prevails, preventing occupants using and enjoying electrical appliances to the full extent otherwise possible.

In many well-furnished, cozy homes, where the liberal use of artistic lamps could ideally be employed and where the cost of current is not the determining factor, the housewife is ofttimes denied the comfort, convenience and beautiful lighting effects because of lack of outlets. The manufacturers suffer because more fixtures, lamps and domestic appliances would be sold if there did not exist this deficiency, and the central station's revenue is not extended as would otherwise be possible.

Take, for example, the flatiron. Some kitchens have but one outlet from which by day the lamp is removed to provide a receptacle for the iron. Night approaches. If a two-way outlet is not in use, the iron must be removed, the lamp returned to the socket, and if it is desirable to continue ironing, some other means than electric ironing must be used. Therefore, instead of current being employed for both lighting and ironing, a lesser amount is ofttimes used, and if this condition should prevail in many kitchens it would have an appreciable effect on central-station loads.

Outlets for any wired homes should be installed to permit the fullest possible use of current. No appliances should remain idle on account of insufficiency of outlets.

Progressive architects and builders should appreciate the advantages of having their houses and apartments properly wired. It will be apparent that fully wired buildings find a ready market, especially if the advantages are brought to the attention of the renting public. Perhaps it would be desirable to concentrate on one or a few houses or apartments in a community. After they had been sufficiently equipped with outlets, it would be an easier task to raise the standard generally by such examples.

Every kitchen equipped with a single outlet should be provided with a two-way outlet so that both lighting and ironing could be conducted simultaneously, which would prove not only an appreciative convenience to the housewife and eliminate undue handling of illuminants, but would, furthermore, involve the use of more current by satisfied customers.

Fractional-Horsepower Motors

The perfecting of the fractional-horsepower motor, while a development of recent years, has of late made remarkable progress. In fact, the varied applications of this type have created a demand which has made it worth while to work out both mechanical and electrical elements of design with the same care which is devoted to large machines. The result is a reliable motor having a reasonable efficiency and suited to a large number of individual applications. Not only direct-current but single-phase motors of satisfactory performance are now available, and it is to the latter that the popularity of small motor applications is largely due, since alternating-current distribution has become also universal except for the business centers of large cities.

Emphasizing Economy

Railroad electrification is still looked upon by the general public and by railroad men as having its chief merit in relieving cities and tunnels of the obnoxious smoke and cinders belched forth by the steam locomotives. Electrical men have in recent years emphasized the economy of electric train service and cited figures proving that 100,000,000 of the 140,000,000 tons of coal now burned annually by our railroads could be saved by general electrification. In view of the continued, if not increasing, need for conserving the fuel resources of the country for future generations, the urgency of attacking the problem and at least checking this gigantic annual waste should be given prompt and careful attention.

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

N. E. L. A. CONVENTION WILL BE HELD IN CHICAGO.

Annual Convention of Association Scheduled for May 31-June 3, With Headquarters at the New Drake Hotel.

Announcement has been made by President Martin J. Insull and the executive committee that the next convention of the National Electric Light Association will be held at the new Drake Hotel, overlooking Lake Michigan in Chicago, May 31-June 3. Chicago was decided upon as the convention city after careful consideration had been given to invitations received from other points.

Because of the conditions attendant upon the reconstruction period, careful consideration led President Insull and his advisers to the belief that this year it would be absolutely essential to hold the convention in a central place easily accessible from all parts of the country, and that geographically, and from a point of view of transportation, Chicago was the logical point at which the convention should be held. One of the principal factors considered in arriving at this decision was the necessity for the leading men in all branches of the industry to pay close attention to the details of their own business, and to keep their fingers upon the place of local happenings in the communities which their companies served. This, they felt, was true from the standpoint of finances and merchandising because of present business conditions, and from the viewpoint of technical experts, because of the tremendous development being undertaken in the electrical industry during the year 1921.

The new Drake Hotel is located at Lake Shore drive and North Michigan avenue, formerly called Lincoln parkway. It is reputed to be the most modern hotel in the United States in every particular, and the N. E. L. A. convention will be among the first to be held in the hotel following its completion.

The convention will open Tuesday morning, May 31, with a general session to be convened at 10 o'clock. It will close Friday night, June 3. It is expected that men of national prominence will deliver addresses at the general sessions. Their names and subjects will be announced in a later issue of ELECTRICAL REVIEW, together with further details of the convention plans.

NEW JERSEY CONTRACTOR-DEALERS ELECT OFFICERS.

Cost accounting was one of the main topics discussed at the annual meeting of the New Jersey Association of Electrical Contractors and Dealers held at Trenton recently. The subject was introduced by Mr. MacIntire, who urged the members to adopt the bookkeeping system of the national association. Mr. Hubben, Westinghouse Electric & Manufacturing Co., gave an address on the possibilities of factory lighting, and stated that the National Electric Light Association expects to have a model light show at the New Jersey Museum of Safety building, Jersey City, where prospective customers may be taken to see approved lighting methods. The next quarterly meeting of the New Jersey association will be held in Newark, April 30. The following officers were elected: President, George E. Davis; secretary, Elmer D. Wilson, and treasurer, Paul H. Jaehnig, all of Newark.

N. E. L. A. GEOGRAPHIC DIVISION ACTIVITIES.

Middle West and Great Lakes Sections Hold Conferences—Plans Under Way to Organize Eastern Geographic Division.

With the object of forming an eastern geographic division of the National Electric Light Association a conference was held Feb. 7 at national headquarters, which was attended by representatives from the states of Pennsylvania, New Jersey and New York. The Great Lakes Geographic Division, N. E. L. A., held a meeting Feb. 9 in Chicago.

The Middle West Geographic Division, N. E. L. A., delegates from the states of Iowa, Kansas, Nebraska and Missouri met at Kansas City, Feb. 2, and discussed state regulation, non-par value stock, and other important public utility questions, including public information, as well as the best method of tying-in with the national campaign of good-will advertising.

The water power committee of the N. E. L. A. held a conference Feb. 10 with the Federal Water Power Commission in Washington to discuss the rules and regulations which are now being prepared by the commission.

There will be a meeting of the National Executive Committee of the N. E. L. A. at national headquarters Feb. 16. The last large meeting of this committee, at which all the geographic division presidents will attend, will be held in Chicago, March 15.

SECTION AND COMMITTEE MEETINGS ARRANGED BY A. I. E. E.

Engineers who are interested in a non-technical presentation of the electron theory should plan to attend the meeting of the New York section, American Institute of Electrical Engineers, to be held in the auditorium of the Engineering Societies building, 33 West 39th street, New York City, Friday evening, Feb. 25, when Dr. Saul Dushman of the research laboratory, General Electric Co., will give a lecture, accompanied by experimental demonstrations, on "Habits of the Electron." The power stations committee of the

institute will have charge of the 368th meeting, to be held at the New York City headquarters, Friday evening, March 11. The subject to be discussed will be "The Developments in Conversion Apparatus for Edison Systems." The Pittsburgh section will meet April 16. The annual business meeting of the parent organization will be held on May 20 in New York City.

N. A. E. C. D. ADOPTS UTILITY RESOLUTION.

The following resolution adopted at a recent meeting of the executive committee of the National Association of Electrical Contractors and Dealers is to be given the widest publicity through bulletins to the membership of the association and through the organization's official publication, the *Electrical Contractor-Dealer*:

"Whereas, the executive committee of the National Association of Electrical Contractors and Dealers recognizes the present need of public utilities in general and electric light and power companies in particular in furthering their sale of securities to the public, be it hereby

"Resolved, that this committee shall offer its moral and active support in promoting the feeling of good will toward said interests, and urges the membership of the organization which it represents to do all in its power toward that end."

SCHENECTADY SECTION, A. I. E. E., HOLDS MEETING.

An address on the "Control for Heavy Traction Electric Locomotives," by Ray Stearns of the railway equipment engineering department, General Electric Co., was the feature of the 233d meeting of the Schenectady section, American Institute of Electrical Engineers, held Feb. 4. Mr. Stearns gave a general historical discussion of control equipment for single-phase and 3-phase a-c. and high-voltage d-c. locomotives, with special reference to the application of regenerative braking as exemplified on the equipment of the Chicago, Milwaukee and St. Paul railroad.

IOWA CONTRACTOR-DEALERS MEET IN DAVENPORT.

Trade Acceptances, Building Situation, Estimating and Possibilities of Expansion in Industry Among Subjects Discussed at Meeting.

One of the main topics discussed at the recent convention of the Iowa Association of Electrical Contractors and Dealers, held at Davenport, was "What's Ahead in Business." The subject was introduced with an address by Howard W. Harrington, Moline, Ill., who said in part: "There are four cycles in any business; the first cycle is the expansion period; the second is the depression or liquidation period; the third is the readjustment period and the fourth is another period of expansion. The law of each depression period seldom, if ever, reaches the first low of the volume of business. The line of advance of business is steady, if a bit uneven. We are now largely through the readjustment period and ahead of us is another period of expansion. The time that this expansion will occur depends largely on the constructive selling efforts that the merchant will put forth." Mr. Harrington's talk was made forceful by use of a chart, showing that the stones of the foundation of any business are service, quality, integrity, responsibility and personality. "The stones may not be of the same depth or importance, and they are valueless unless they are cemented together for a foundation," Mr. Harrington remarked.

Other speakers were F. J. Bernick, Jr., secretary of the association, on "Aims and Activities of the Iowa Association"; J. A. Weishar, Rock Island, Ill., on "Local Association Activities"; C. R. Robbins on "Estimating"; J. M. Crotty, Chicago, on "Credits and Finances—Trade Acceptances"; E. J. Burns on "The Building Situation," and Ainslie A. Gray, Chicago on "The Electrical Industry."

A resolution was adopted, taking exception to the report of the National Board of Fire Underwriters that electricity was the principal cause of fires in the United States from 1915 to 1919.

ELECTRIC AUTOMOBILE SHOW POPULAR AND EDUCATIONAL.

New York Edison Co. Sponsors Exhibit Which Demonstrates Possibilities of Electric Automobiles for Business and Pleasure Purposes.

Regular visitors to the large showroom of the New York Edison Co., 10 Irving place, New York City, have been pleasantly surprised during the last two weeks to find the usual display of electrical labor-saving devices and heating appliances for the home supplanted by various types of electric automobiles, trucks and accessories. A unique feature of this show was that no admission was charged to the public and the exhibitors were not required to pay for the space used.

The first week beginning Jan. 29, commercial trucks, passenger cars, storage batteries and garage accessories were on view, while the following week was devoted exclusively to displaying industrial trucks and accessories, with a veteran truck of ten years' service holding the position of honor. The exhibit was well patronized and undoubtedly resulted in acquainting the public with the advantages and possibilities of the electric automobile both as a business and pleasure car.

In connection with the show a luncheon was held at the Hotel Astor on Feb. 2 and over 200 men interested in the industry attended. Arthur Williams, general commercial manager, New York Edison Co., acting as toastmaster, reviewed the phenomenal increase in the use of electric vehicles in New York City in 1920, with promises of even greater progress this year, and pointed out that the service-giving qualities were proved by the number of trucks with records of more than ten years of active service. Robert E. M. Cowie, vice-president, American Railway Express Co., stated that his company with 642 motor-driven trucks was one of the largest operators in New York City, and of this number, 52.3% were electrics, which had proved to be more economical in their upkeep than two-horse-drawn trucks. In conclusion he stated that the lack of adequate storage space or garages handicaps the use of the electric vehicle in New York City, and if a plan whereby the city's street traffic transportation was

materially speeded up, the overhead cost of doing business would be greatly lowered for merchants.

Ex-governor Alfred E. Smith, who is now associated with a trucking concern, said that coaling large offices at night had cut in half the time required for doing the work in the daytime and he believed that since a scientific solution of the traffic conditions in New York City seemed the most logical, the plan of the state commission, which had made an exhaustive study of the matter, should be adopted.

Among the exhibitors during the two weeks were: Edison Storage Battery Co.; Electric Storage Battery Co.; Philadelphia Storage Battery Co. A. & J. M. Anderson Manufacturing Co.; Auto Electric Devices Corp.; Lakewood Engineering Co.; Cutler-Hammer Manufacturing Co.; General Electric Co.; Rauch & Lang, Inc., and the Westinghouse Electric & Manufacturing Co.

BUREAU OF ECONOMICS CREATED IN CALIFORNIA.

Public Service Organizations of State Heartily Support Institution Which Will Collect and Distribute Industrial Statistics.

A bureau of economics, created to make exhaustive studies of the economic requirements of California and to look into the financing and needs for adequate development of public service organizations, has been adequately financed and set up in Sacramento. The findings of this bureau will be placed from time to time before the banks and financial houses of the state.

The newly created bureau has been assured the full support of the public service organizations of the state, which have agreed to throw open their books and statistical records for the furtherance of the proposed studies.

D. M. Reynolds, Pasadena, who becomes the managing director of the bureau, fully understands the methods for obtaining and disseminating information of this type. During the war he was in charge of this work for the United States Council of National Defense in Washington and served the council in the allocation of labor and materials to industry throughout the United States in the building up of the war machinery. He is still the representative of the Council of National Defense for the territory west of Chicago.

Mr. Reynolds is thoroughly acquainted with California conditions, especially in connection with utility and transportation companies. At the present time he is a director of research for the First National Bank of Los Angeles, and the Los Angeles Trust and Savings Bank.

Actively associated in this work with Mr. Reynolds are such men as Herbert N. Shenton, of Columbia University, formerly director of the United States Council of National Defense, who will have charge of the New York and Washington offices; R. M. MacLennan, formerly of the United States Food Administration; and James R. Nourse, of Washington, D. C., who is in charge of the distribution of data from Sacramento.

Sacramento was chosen as the distribution center for the bureau because in Sacramento centers much of the information available through the various departments of the state government. The information disseminated by this bureau will be at the disposal of the banks and financial houses of the state and those eastern financial houses which are interested in California securities, and it is the announced policy of the bureau to put into effect for California's industries an organization for gathering and distributing information similar to that set up in Washington during the war.

"The need for proper development of California's natural resources and her utilities along basic economic lines," Mr. Reynolds declared, "is readily shown by the fact that while during the last census period the population of California increased 44.1%, the demand for hydroelectric power jumped from 1,250,000,000 kw. hrs. annually to 3,750,000,000 kw-hrs., or 300%.

"Without coal; with a natural gas shortage—gas is now rationed by the railroad commission—and with transportation and financial difficulties; with California now operating 50% more wells than 5 years ago to produce practically the same amount of oil; with drafts upon the oil reserve stocks at the rate of 10,000,000 bbls. a year; with gasoline being rushed across the continent by special trains, and with 30-ct. gasoline in prospect; with hydroelectric power rationed to such an extent that extra drains have been made upon our oil stocks to develop electric energy, the question of future growth of California is not entirely without its difficulties.

"Before the war the Pacific coast could go to the East for money to carry on her new work, while the East could go to Europe for aid in financing American projects. Today the situation is changed. New York is now the money center of the world, and the Pacific coast must compete not only with eastern demands, but with Europe, for that part of eastern financial support which was formerly freely accorded. This results in two things: The securities which we attempt to float on the eastern market must be of higher grade in the future than they have been in the past, and earnings must be assured."

EARNINGS OF TELEPHONE COMPANY LOWEST IN HISTORY.

Annual Report of Illinois Bell Telephone Co. Says War Period Cost Company and Patrons More Than Eight Millions of Dollars.

The year 1920 made unprecedented onslaughts on earnings of the Illinois Bell Telephone Co. according to the annual report. The statement reveals the fact that the war cost the telephone company $8,000,000. The past year was the low-water mark of earnings.

The annual report shows net earnings of only $3.56 per share on the company's outstanding 400,000 shares of $100 par value, compared to $5.55 per share for the year preceding. Gross revenue was $33,361,416 and expenses $31,934,955, which, plus the usual dividends, made the disbursements $1,773,539 greater than the receipts. The statement said the war had cost the company and the subscribers more than $8,000,000. It said rates had been increased by about

$4,300,000 since 1916, but despite this the company in the 4 years had faced annual deficits which had to be taken from the surplus and which totaled approximately another $4,000,000. The surplus Dec. 31, 1920, was $629,980.

ELECTRICAL GOODS EXPORTS SHOW INCREASE IN NOVEMBER.

Total Amounts to $10,518,628, an Increase of $3,814,444 Compared With Same Month Last Year—11 Months' Figures Are $88,177,824.

The exports of electrical goods to foreign countries for November were valued at $10,518,628, compared with $6,704,184 for the corresponding month in 1919, or an increase of $3,814,444. For the 11 mo. ending November, 1920, the total exports amounted to $88,177,824, an increase of $5,753,773 over the 1919 figures and an increase of $33,382,272 over the total for the 11 mo. ending November, 1918.

The following classified figures give the detailed data for November, 1920, compared with the corresponding month for the previous year:

	November, 1919.	November, 1920.
Electrical machinery and appliances (except locomotives):		
Batteries	$ 406,722	$ 615,402
Carbons	61,971	130,447
Dynamos and generators	617,981	824,515
Fans	68,298	122,132
Heating and cooking apparatus	117,772	151,001
Insulated wire and cables	535,746	1,033,898
Interior wiring supplies, including fixtures	174,640	326,772
Lamps—		
Arc	1,904	4,900
Incandescent—		
Carbon filament	41,501	7,094
Metal filament	253,963	476,043
Magnetos, spark plugs, etc.	237,604	304,479
Meters and measuring instruments	156,655	221,058
Motors	1,003,864	1,406,149
Rheostats and controllers	40,655	100,295
Switches and accessories	229,941	396,927
Telegraph apparatus, including wireless	37,147	106,008
Telephones	373,610	477,492
Transformers	157,381	341,345
All other	2,186,829	3,472,672
Total electrical machinery, etc.	$6,704,184	$10,518,628

BUSINESS SHOWS A SMALL GAIN IN JANUARY.

Federal Reserve Board in Its Monthly Review of Conditions Reports Slight Increase in Industrial Activities of the Country.

The Federal Reserve Board in its review of conditions for the month of January claims a slight but unmistakable turn toward the better. The board comments on the recent estimate of the United States employment service that 3,473,466 fewer people were employed in industry Jan. 1 than a year ago and states that there has been only a slight increase in industrial activity. It is probable that the slight increase in activity in leading New England industries during the month has brought a measure of relief. In the South and West the situation has become more acute, while in the San Francisco district, previously only slightly affected, unemployment is abnormally great for this season.

Wage reductions have likewise continued and have spread to sections where wage rates have hitherto been maintained at high levels, continues the report. In the New England district probably 100,000 operatives in textile mills have been affected by wage reductions which on the average amount to about 22.5%. It is stated that the decrease in wholesale trade activity continued throughout the month. Sales as measured in terms of value were extremely light and losses were reported both as compared with the preceding month and a year ago. Retailers generally have placed few orders. The board reports that banking conditions have materially improved, partly through the steadier and more rapid movement of agricultural products to market and partly through the more rapid liquidation of paper held by member banks. It is noted that the reserve ratio had risen to 49% at the last reporting date in the month, Jan. 28.

RESULT OF A REFERENDUM VOTE ON STREET RAILWAYS.

Recommendations of Committee on Public Utilities of National Chamber of Commerce Approved by Organization's Membership.

A program looking to improvement of the situation of the country's street railways was advanced by the Chamber of Commerce of the United States as the result of a referendum vote of the organizations making up the chamber's membership. Eight recommendations which had been put forward by the chamber's committee on public utilities were approved with few dissenting ballots. The proposals of the committee and the vote on each follow:

1. Existing traction facilities should be conserved—for, 1689; against, none.
2. The attitude now taken towards street railway problems should be based on the present and future needs of the community—for, 1677; against, none.
3. The attitude which is taken towards street railway problems should contemplate private ownership and operation—for, 1657; against, 24.
4. Regulation should everywhere be instituted that will follow promptly changes in the situation of the companies rendering service of local transportation—for, 1666; against, 4.
5. Provision should be made against the consequences of unfair competition—for, 1653; against, 16.
6. All burdens unrelated to the service performed should be removed from street railways—for, 1460; against, 167.
7. Official responsibility should be definitely fixed for the application of regulation—for, 1682; against, 3.
8. Each company should seek to have available for the public at all times the facts as to the results of operation and should have resident responsible executives wholly conversant with local requirements—for, 1683; against, 1.

WHITE CEDAR ASSOCIATION ELECTS OFFICERS.

At the annual meeting of the Northern White Cedar Association held at the Hotel Radisson, Minneapolis, Minn., Feb. 8-9, the following officers were elected: President, Benjamin Finch, Duluth, Minn.; vice-president, W. B. Thomas, Manistique, Mich.; treasurer, H. F. Partridge, Minneapolis, and secretary, Norman E. Boucher, 702 Lumber Exchange, Minneapolis.

BILL TO PROHIBIT INCREASE OF UTILITY RATES.

The New Jersey legislature is considering a bill introduced by Assemblyman Loori, Hudson county, prohibiting public utilities in the state from increasing rates for service. The measure

defines utilities as "every railroad, express, electric light, heat and power, street railway, canal, subway, gas, water, sewer, telephone and telegraph corporation, association, or joint stock company." And such company operating for public use shall not increase its rates within a year after the passage and approval of the bill. The statement attached to the measure sets forth that "the purpose of the bill is to protect the public against unreasonable increases of rates by public utility corporations."

ROCHESTER A. I. E. E. DISCUSSES SHIP PROPULSION.

Electric ship propulsion was discussed at the fiftieth meeting of the Rochester (N. Y.) section, American Institute of Electrical Engineers, Jan. 28. A film entitled "Queen of the Waves" showed the development of ship propulsion in America from the primitive methods of the Indians to the completion of the U. S. S. *New Mexico*. Lieut. R. D. DeWolf, electrical officer on the U. S. S. *Nevada* during the war, explained the details connected with the operation of an electric ship.

TRUCKING PROBLEM DISCUSSED AT NEW YORK MEETING.

The New York Electrical Society held its 389th meeting Feb. 9, when the following addresses were made: "The Trucking Problem of New York City," by J. J. Riordan, president of the United States Trucking Corp.; "The Electrotechnical Aspect of City Trucking," by Arthur Williams, past-president of the New York Electrical Society, and "The Electric Vehicle for City Delivery," by James H. McGraw.

MOTION PICTURE FILMS SHOWN AT I. E. S. MEETING.

"The Making of Colored Moving Picture Films" was the subject of an address by William V. Kelly, Prizma Corp., before the New York section, Illuminating Engineering Section, Feb. 10. The paper was accompanied by a demonstration of motion picture films displaying the subject in natural colors as seen by the naked eye. The process of manufacture and the methods used to secure such results were also explained.

ELECTRICAL SAFETY CONFERENCE TO MEET.

The next meeting of the Electrical Safety Conference is scheduled to be held Feb. 16 at 25 City Hall place, New York City. The regular meetings of this body are held in New York City on the third Wednesday in February, April, June, October and December of each year. At these meetings committee reports are considered and general plans discussed for advancing the work of the Conference.

MINING ENGINEERS MEET.

The New York section, American Institute of Mining and Metallurgical Engineers, at its recent meeting discussed the subject of "Copper Metal—From the Consumer's Point of View." Among the speakers were Ivy L. Lee; W. S. Barstow, electrical engineer; William S. Murray, chairman of the Superpower Survey, and H. A. C. Jenison, United States Geological Survey.

ENGINEERS ELECT OFFICERS.

The following officers were elected by the board of trustees of the United Engineering Society at the annual meeting: President, J. Vipond Davies; first vice-president, Calvert Townley; second vice-president, W. L. Saunders; secretary, Alfred D. Flinn; treasurer, Joseph Struthers, and assistant treasurer, George H. Pegram.

COMING CONVENTIONS.

National Council of Lighting Fixture Manufacturers. Annual convention and lighting fixture market, Elmwood Music Hall, Buffalo, N. Y., Feb. 14-19. Secretary, Charles H. Hofrichter, 8410 Lake avenue, Cleveland.

American Institute of Electrical Engineers. Midwinter convention, Engineering Societies building, New York City, Feb. 16-18. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

Associated Manufacturers of Electrical Supplies. Annual convention, New York City, March 15. Headquarters, 30 East 42d street, New York City. General secretary, Charles E. Dustin, Hartford, Conn.

Electrical Supply Jobbers' Association. Quarterly meeting of Atlantic Division, New York City, March 15. Headquarters, Hotel Commodore. Secretary, E. Donald Tolles, 52 Broadway, New York City.

Joint meeting of Illinois State Electric Association, Illinois Electric Railways Association and Illinois Gas Association, Chicago, March 15-17. Headquarters, Sherman House. Secretary, R. V. Prather, Springfield, Ill.

American Washing Machine Manufacturers' Association. Meeting at Sherman Hotel, Chicago, March 16-17. Secretary, Enoch B. Seitz, Otis building, Chicago.

Wisconsin Electrical Association. Annual convention, Milwaukee, March 22-24, jointly with the Wisconsin Gas Association. Secretary, J. P. Pulliam, 1408 First Wisconsin National Bank building, Milwaukee.

American Electrochemical Society. Spring meeting, Atlantic City, N. J., April 21-23. Headquarters, Hotel Chalfonte. Secretary, Joseph W. Richards, Lehigh University, Bethlehem, Pa.

American Society of Mechanical Engineers. Spring meeting, Chicago, May 23-26. Headquarters, Congress Hotel. Assistant secretary, C. E. Davies, 29 West 39th street, New York City.

Electrical Supply Jobbers' Association. General meeting, Hot Springs, Va., May 25-27. General secretary, Franklin Overbaugh, 411 South Clinton street, Chicago.

Pacific Coast Geographic Division of the National Electric Light Association. Annual convention, Del Monte, Cal., May 25-27. Headquarters, Hotel Del Monte. Secretary, L. H. Newbert, 445 Sutter street, San Francisco.

North Central Electric Association. Annual convention, Duluth, Minn., June 14-16. Secretary, H. E. Young, 15 South Fifth street, Minneapolis, Minn.

Tri-State Water and Light Association. Annual convention, Asheville, N. C., June 15-16. Secretary, W. F. Steiglitz, Columbia, S. C.

National Fire Protection Association. Annual convention, San Francisco, June 14-16. Secretary, Franklin H. Wentworth, 87 Milk street, Boston.

American Institute of Electrical Engineers. Annual convention jointly with the Pacific Coast convention, Salt Lake City, Utah, June 20-25. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

National Association of Electrical Contractors and Dealers, Anniversary convention, Buffalo, N. Y., July 20. Secretary, W. H. Morton, 110 West 40th street, New York City.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

GROWTH OF BROOKLYN EDISON CO. DESCRIBED TO EMPLOYES.

General Sales Agent Jones Points Out in Address How Company Kept Pace With Development of Community During Past Five Years.

An address on "The Growth of the Brooklyn Edison Co." was delivered recently by T. I. Jones, general sales agent of the company, before an audience composed of the central-station company's employes and representatives from out-of-town electrical industries. The talk was illustrated by lantern slides. Mr. Jones showed how many additional users of electricity had been added to the company's patronage during the past year; also that the number of users of electricity in Brooklyn had more than doubled during the past 5 years.

Pictures were shown of a number of industrial developments in the Borough of Brooklyn during 1920, involving in several cases the establishment of new activities in that city. The speaker indicated that in spite of the comparatively small number of new dwelling houses erected in Brooklyn, a great many new residence customers had been added, because of the tendency of the times to improve dwellings already existing, making old houses modern. He also described the great increase during the year in the use of electrical labor-saving household appliances.

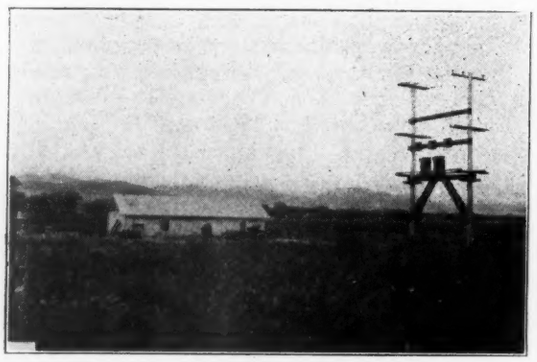
Mr. Jones showed the heavy increase in equipment expense necessary on the part of the company to take care of this increased business and keep pace with the development of the community. This also involved radical changes and improvements in organization and methods which had been accomplished during the year. At the completion of Mr. Jones' talk short addresses were made by the representatives of out-of-town companies.

ELECTRIC COMPANY SERVES AGRICULTURAL TERRITORY.

San Diego (Cal.) Consolidated Gas & Electric Co. Furnishes Electricity to More Than 1200 Farms and Ranches in Southwest.

The constantly growing network of transmission lines of the San Diego (Cal.) Consolidated Gas & Electric Co. traverses a productive agricultural territory, in consequence of which a large number of farmers and ranchers have taken advantage of the electric light and power service thus made available. More than 1200 farms and ranches, with combined power requirements of 4826 hp., are now served electrically by the company, lighting and household appliance requirements, including electric ranges and water heaters, aggregating 2400 hp. About 500 hp. of the load is used for feed cutters, grinding machines, milking machines, refrigerators, etc., while the remaining 4326 hp. is utilized for irrigation purposes.

Most of the water is pumped from sands of the river bottoms, where it settles about 20 ft. below the beds of the rivers and creeks in dry seasons. Many pumping problems have arisen, but the commercial department of the San Diego company, under the supervision of A. E. Holloway, has been able to solve them all, and electric power for pumping has come to be the most popular form of power for these irrigation installations. Not alone is electric power the most desirable, but it is very economical as well, one installation upon which careful tests have been made showing a cost of $0.02.02 per 1000 gals. Many automatic features have been worked out



One of the Large Irrigation Systems Served by San Diego (Cal.) Consolidated Gas & Electric Co.

in connection with these installations which have proven very dependable and reduce materially the attention required for operation. The plant referred to was formerly operated by steam and required the constant attention of three men; now one man takes care of the entire system alone.

In the agricultural districts the company numbers more than 1000 lighting customers, 200 of whom use electric ranges for cooking and 75 have electric water heaters. As the average monthly bill for lighting, cooking and water heating is only $8 and the service has been satisfactory, the number of electric range and electric water heater customers is increasing quite rapidly.

INCREASED POWER DEMAND IN NEW JERSEY.

According to records compiled by the Public Service Electric Co., Newark, N. J., operating in different sections of the state, there was a noticeable increase in power demand in the year just closed. The central stations of the company furnished power to the amount of approximately 350,000,000 kw-hrs. for industrial serv-

ice during 1920, representing about 466,000,000 hp-hrs. This power was supplied through a total of about 14,000 meters. In the lighting branch of the business the increase in this same period totaled about 16% over the year 1919. The advance indicates a large number of newly wired houses. The electric utility did not experience any interruption in service due to the coal situation during the year, and one of the accomplishments was the perfecting of arrangements by the company for the purchase of 600 50-ton coal cars, which it is believed will assist materially in eliminating any difficulty on the coal supply question in the future.

CREATING FAVORABLE IMPRESSION ON CUSTOMERS.

Official of Philadelphia Co. in Address to Employes Offers Suggestions for Improving Service to Patrons of Public Service Co.

In a recent talk given before the employes of the Philadelphia Co., James W. McKelvie, manager of the inquiry department, touched on the subject of "The Public and How to Treat Them," extracts from his remarks being presented herewith:

"This is a subject in which we as employes of a public service company are vitally interested. Our company generates electric current for which the public contracts, specifying that they will pay for the service rendered in accordance with the price specified in our schedule of rates applicable to the class of service for which contract has been made. The supplying of the commodity is only a part of the contract; the public expects continuous service of a quality that meets their every requirement. Employes should bear in mind that to the customer they are the company and if we greet them with a smile and are painstaking and fair it will make a favorable impression on the customer. Also let us remember that the customer is right until proven otherwise and when there is a question as to who is right I believe we should favor the customer.

"We should strive earnestly to gain the confidence of the public, and a good way to accomplish this is by playing fair and showing that you trust them. The relations between the public service company and its customers should be the same as that which exists between two friends. When a friendship is broken it is usually because of lack of faith, or a suspicion of one party of the other. This applies to a corporation just the same as it does to individuals. Personality and sincerity are two qualities that should characterize our work. We should put our own selves into whatever condition presents itself and show that we are familiar with our work.

"I have touched thus far on the manner of handling customers who call at the office, but there is another avenue by which we deal with our customers, and I have reference to conversations on the telephone. The tone of voice used is the only way by which the customer can judge our attitude, so we should be most careful as to how we speak over the telephone. It would be a good thing when answering a call to give our name so that the customers may know to whom they are speaking, and in case a second call is necessary they will know whom to ask for. If these suggestions are borne in mind it will make for improved service and add considerably to the list of satisfied customers, which should be the aim of all public service employes."

CENTRAL STATION REVIVES SAFETY-FIRST MOVEMENT.

United Electric Light & Power Co. Appoints Committee to Supervise Activities Among Employes With Object of Minimizing Accidents.

Safety-first activities, which were restricted to a large extent by important war obligations in the last few years, have been resumed by the United Electric Light & Power Co., New York City. A general committee embracing every department of the company has been appointed to meet monthly to hear and consider the reports of subcommittees and devise ways and means of minimizing the so-called unavoidable, careless and all other classes of accidents by educating and instructing the company's personnel and by improving and safeguarding equipment that presents an injury hazard.

An interesting innovation intended to arouse the interest of employes in the movement and to make them think has been adopted. This is based on the utilization of the weekly pay envelope to convey a safety message to every employe regularly. The first notice was in the nature of a New Year's greeting from the committee and was followed up by a notice showing the number and percentage of accidents in the various departments of the company happening during a given period. It was hoped in this way to arouse departmental pride and rivalry. The committee intends to present pictorially the results of accidents by this method and bring the consequences of carelessness forcefully to the attention of every employe.

GAIN IN LOAD OF STANDARD ELECTRIC UTILITIES.

The electric service companies controlled by the Standard Gas & Electric Co. are now supplying power and light amounting to upwards of 1,000,000 hp., the gain for the year 1920 being more than 90,000 hp., or approximately 10%, as indicated by a compilation prepared from the manager's weekly letters for the year. The companies now serve 484,000 customers, of which 317,500 are consumers of electricity. The electric-connected load is made up as follows: 379,400 kw. (or 506,000 hp.) of lighting; 430,000 hp. industrial power business; 10,000 hp. street railway load, and a large amount of household electrical appliance business, the total capacity of which it is impossible to estimate.

Developments made in the application of telephone receivers, used in connection with a transmitter carried by the user, make it possible for all but the totally deaf to hear. A type of equipment coming into common use employs a sounding device so small that it may be inserted in the canal of the ear where it may be almost invisible.

CONTRACTOR-DEALER

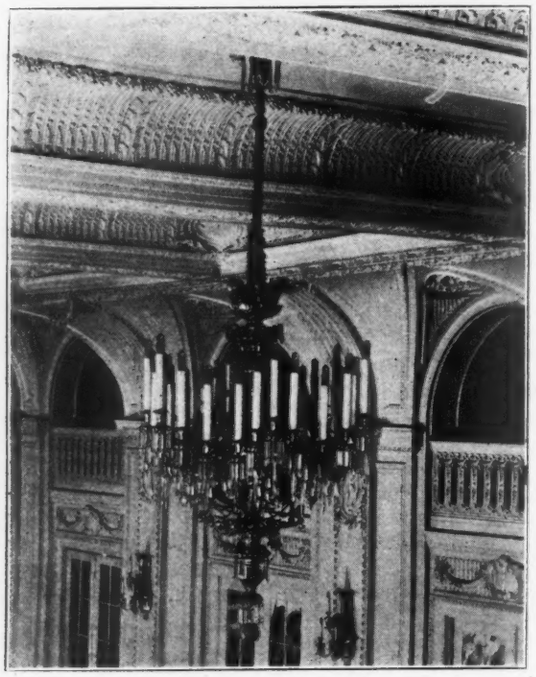
An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Storekeeping for the Dealer in Electrical Goods

SELLING LARGE LIGHTING FIXTURES FOR PUBLIC PLACES.

Special Units Are Designed and Made to Order by Manufacturers for Hotels, Clubs, Churches and Other Large Establishments.

Electrical contractors will always have the support of lighting fixture manufacturers in securing orders for large special types of lighting fixtures, and if the contract is handled with good judgment and upon the advice of the manufacturer or his representative, the profit is much greater than for the installation of the smaller fixtures.

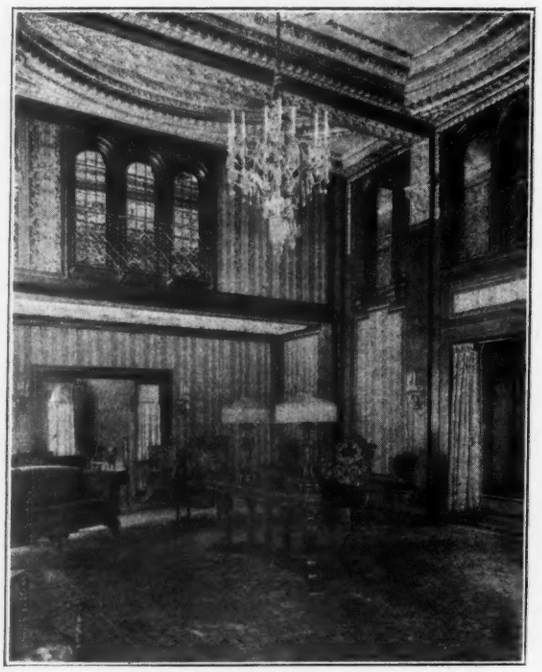
Hotels, theaters, club houses, churches, auditoriums and large residences must be provided with fixtures designed to harmonize with their interior finish as well as produce proper lighting effects, if pleasing and satisfactory results are to be obtained. Such fixtures cannot be purchased from stock, because stocks could never be prepared to meet the different needs without unwarranted cost and the sacrifice of many details of individualism. The great variety of combinations of architectural and decorative details employed in the interior finish of large buildings precludes the possibility of ever arranging a line of standardized fixtures that would give both satisfactory



Chandelier in Ball Room of Hotel Robidoux, St. Joseph, Missouri.

lighting and architectural effects. Thus it is evident that there is and probably always will be a wide field for the sale of special lighting fixtures.

One of the illustrations herewith shows an installation of a chandelier in the ball room of the Robidoux Hotel in St. Joseph, Mo. This chandelier fits in well with its surroundings and helps to convey the impression of massiveness and splendor. Richness of detail and complete har-



Installation of Special Chandelier in Palatial Chicago Residence.

mony with the general scheme of the interior finish may be seen in the other illustration showing a large residence fixture installed in the palatial home of a Chicagoan.

Molding, filing, fitting, brazing, hammering and spinning form the ground work or body structure of the fixture. Sometimes metal or composition bodies are worked into or over the main structures, and in other instances separate parts are attached by means of hooks, chains or other supporting members. At the present time there is a tendency to add crystal ornaments to many of the fixtures being made for large auditoriums, these crystal ornaments being typical of certain period styles of architecture now much in favor. The metal structure, or the body if one is used, must be finished in coloring suitable to the surroundings. Paints, polychrome finishes, silver, copper and gold plating, and various other processes are used to give the intermediate and final touches of finish. Often many coats of paint are applied, one partly or completely covering another, with sometimes two or three colors remaining in a mottled pattern over a solid background in the completed job.

Business Hints for the Dealer

Being Truthful and Constructive—Bringing Order Out of Chaos — Tying Up with National Advertising and "Dealer Helps"

"There are two things to be remembered in all advertising," says Jay J. Keith, advertising manager for Altorfer Bros. "They are: Be truthful; be constructive—don't 'knock' the other fellow."

This statement is just as true in the advertising of any other line as it is in advertising of washing machines. The dealer or jobber should remember in his local advertising that it takes money to build good will. This is one of the three chief aims of national advertising; to build permanent good will, to educate the public to the use or need of the machine advertised, and to sell goods. The first builds trade for the future and the last is to sell goods, as it says.

In view of the fact that many manufacturers spend thousands of dollars to build up good will, the jobber or dealer should be careful not to destroy this good will in any way. A recent bulletin issued in behalf of more truthful advertising, cited several instances where the good will of the manufacturer and his product was perilously threatened by the ignorant and untruthful statements used by a jobber in advertising in his local newspaper. Sometimes these mistakes are made in ignorance and again a jobber or dealer may figure that a little more prestige might come from an extra strong statement. This is something that should be watched closely and no statement should be made which cannot be backed up by the manufacturer's advertising.

It is well to follow closely the style and copy of the manufacturer's national campaign and thus get the benefits of a tie-up between the local advertising and the national campaign. A majority of large manufacturers in the farm implement and machinery field furnish newspaper cuts to their dealers as asked for and urge their judicious use, and the wise agent will find it of advantage to advertise and sell nationally advertised articles. A good idea is to spend 50 to 60% of the advertising appropriation in newspaper advertising on the machine or line that is classed as a leader. The remainder can be profitably used for direct-by-mail campaign posters, car cards, etc., but in all advertising it is a good idea to make all the statements truthful and constructive—don't "knock!"

Little Details in Shop Management.

"The profit to be made in the electrical contracting business depends, just as in any undertaking, on the manner in which the business is conducted, efficiently or otherwise. One of the very important things is to reduce the amount of labor required to do a job, and it pays to have the shop and stock arranged so the workmen can get out material and find stuff needed in the shortest possible time," says a western contractor-dealer. "Our shop formerly had the usual shelving about 12 ins. deep and sections about every 3 ft. with the shelves 12 ins. between. In this space the cartons of package goods were stacked and the broken packages soon were scattered about and fell down to other shelves below. Soon we had a mixture which cost as much to keep sorted as the goods were worth themselves. We had trays for fixture and other small parts, with divisions for the various articles. We found that these small parts got into the wrong compartment, this being especially true of screws, and it seems as though we had the shop boy busy all the time sorting these things out only to have them get back into the same state of disorder again in a short time.

"After some study, during which we were about to buy the regular drawer cases now put out by several makers, but which we found too expensive to use on a large scale, we simply put in extra shelves so that now we have only 6 ins. between the shelves, and put in regular bread tins of the common black kind which were rather old stock for the hardware man who let us have them cheap. In these all the broken package goods are kept and the extra shelving gives us twice the space we had before, as with 12-in. shelving the shelves were seldom filled to the top. We also got from the drygoods store an old pattern case which will just take a cigar box in the divisions. Into old cigar boxes we put all fixture parts, fastening a sample on the outside by boring a hole for ⅛-in. pipe, which most small fittings are, and using a close nipple and a ⅛-in. lock nut on the inside. Our stock of parts is now in orderly shape. If one will follow this plan it will be surprising how much time is saved in getting out material for a job and how much neater and better the shop will look.

"For our screws we use a shelf about 36 ins. long with shelves about 4 ins. apart and 8 ins. deep. Into this we set 'muffin tins' of the deep kind. This makes a good place for the many different kinds of small screws, etc., used in our shop, and by keeping all larger quantities of wood screws in small bread tins and cigar boxes, all of which are chained to the front of the shelf by small furnace chain; no boxes can be removed entirely, but still far enough to get the screws out.

"Altogether we feel well repaid for the time and comparatively small expense entailed in making these changes. If any contractors ever get all wrought up trying to find some small article to make a repair while a customer is waiting but don't just remember where it was placed, it would pay to try the arrangement suggested and see how much more satisfactory it is to have things where they can be located in an instant, no matter how little used. Such articles may be, sometimes they will be, wanted and probably in a hurry, and it pays to have everything in the shop arranged systematically. This work can be done in dull periods.

The dealer who is handling well advertised lighting fixtures is overlooking an asset if he does not utilize the advertising matter which is furnished by the manufacturer. This material costs money, and it can be made to make money for the dealer in the form of profitable sales. Get it,

and when you have it, use it, which means to display it where it can be seen—in the windows, in connection with displays of the goods; on the counters and elsewhere inside the store.

In one store the dealer has a big section of his wall reserved for the posting of advertising placards. The background consists of dark green burlap, and the space is cut up by narrow strips of wood, so that the placards are attractively framed and set off. When he gets cards carrying the announcements of the makers regarding the goods which he has on sale, he places one of them in this space, and people who come in the store are immediately confronted with this bulletin board, as it were, of the latest and best in the electrical merchandise field.

You never hear this dealer kicking about slow business, because he doesn't experience it. His own aggressive sales methods, coupled with the intelligent use of the expensive and effective publicity matter of the manufacturers, insure good trade with him all the time.

"I would no more throw away this advertising matter," he declared recently, "than I would destroy postage stamps. Both cost money, and both are necessary to the operation of this business."

Advertising Assures Quick Turnover and Continued Success.

Survey of any successful business institution will disclose that the chief factor of that success lies in nothing more than the turning over of the merchandise—the bigger the store the more they keep the merchandise moving. There is no money in the stock that sticks to the shop. The dealer must keep the stock coming in the rear in cases and going out the front in packages. The way the successful merchandiser does that is by advertising and making his advertisements a daily and weekly matter of interest to the families of his community. He does not make a splurge now and then, but he keeps his advertisements running and keeps them interesting.

A careful survey of business houses proves that 99% of those rated at $100,000 or more are liberal advertisers. A careful checking of the stock in ten country stores proves that more than 90% of the best sellers were nationally advertised. An investigation in homes shows positively that a majority of all furniture, clothing, food and personal property was introduced into the homes by advertising, even though each article was purchased from the local dealer.

SUGGESTIONS FOR VALENTINE DAY WINDOW DISPLAY.

Popular February Event May Be Made to Awaken Interest in Electrical Appliances for Appropriate Valentine Tokens.

Valentine Day comes at a psychological time of the year—at a time when the merchant is generally looking around for something new to arouse interest among prospective customers and at a time when the customers are tired of winter and are looking for something novel, interesting and different.

Consequently Valentine Day offers a splendid opportunity to the alert electrical dealer for doing something unusual and striking—something that will make folks stop and take notice and talk about the store with the result that the store will secure a great amount of highly valuable word-of-mouth advertising.

But just what can the store do for Valentine Day that will be different and interesting?

Suppose that the store put a Valentine Day display in its show windows; that it placed hearts of various sizes on the background of the windows, on the walls and on strings suspended from the ceilings. Such windows would, of themselves, prove attractive to a great many people. And the windows would prove doubly attractive if some of the hearts were lettered with some sentiment in verse. Others could bear the admonition to "Give her an electric valentine." If the store wanted even greater variety in the hearts, it might use the following sentiment on some of the hearts:

TO YOUNG MEN:

Be modern, fellows, that's the way
To win the ladies, nowaday.
Electric Valentines we know
Will surely make her love you so.

Valentine Day is always the day for versified sentiments and consequently a large proportion of the folks who pass an electric store having window displays of that nature would be pretty sure to stop and look at the displays. And it is pretty certain that a large percentage of those who did stop and look would talk to their friends and relatives about the display and thereby give a great amount of advertising to the store.

It is fairly certain that an electric shop that went out of its way to tell the young men of the city to be modern in the valentines they sent and, also declared emphatically that electric goods made the best valentines, would start a lot of interest among the unmarried young people of the city.

To back up a display for Valentine Day the store might arrange a special "Valentine Sale" in which it would offer electrical goods, all neatly packed and sealed with hearts and with cards in the shape of hearts on which the donor of the gift could write the name and address of the person to whom the article was to be sent. The store could also make a special effort to sell electrical valentines to married men. It could drive home the fact that many of the married men of the city used to make a practice of sending valentines to their wives before marriage and could suggest that it would be a commendable thing to keep up the practice by sending the wife a useful valentine this year.

LENDING LIGHTING FIXTURES.

If a business firm of any kind wishes to feature a window display that is arranged to represent a room in some home and a request is made for lighting fixtures the electrical dealer should not be backward about loaning them. A well arranged display of this kind looks very attractive and customers are apt to want different things that make up the display for their own homes. Of course, the firm using the fixtures should let the public know where they were obtained by making announcement on a card placed in the window.

QUESTIONS AND ANSWERS

All Readers Are Invited to Submit Contributions on Electrical Matters to This Department—Answers Should Be Sent Within Eight Days of Date of Publication of Question—Payment Will Be Made for All Answers Published

Questions.

No. 510.—Advisability of Holding Sales of Electrical Goods.—I have been endeavoring to learn from various sources, including jobbers, dealers, etc., the advantages to be gained by and the difficulties met with in conducting a sale or sales of electrical goods. Other merchants have sales for the purpose of raising money, reducing stock and cultivating new customers, and I want to find out if the electrical dealer can benefit by following their example. Will dealers or others in touch with the situation give their views on the subject?—W. R. B., Phoenix, Ariz.

No. 515.—Precautions Taken in Grounding Lines and Buses.—What precautions are taken to guard against errors in making ground connections in power houses to high-tension cables and buses? Mistakes that have been costly in both life and property have been made, and it is believed that a free discussion of present common practice will be of much benefit. What bus- and line-clip arrangements are used? What locks and hold cards are used? Is it common practice to check connections twice or to have two different men check the connections? Are definite steps taken to see that the ground is maintained even though a mistake has been made?—A. L. T., New York City.

No. 516.—Winding for Three-Phase Motor.—I have a four-pole, 220-volt, three-phase induction motor rated at 0.5 hp. and rewound with 24 coils in 24 slots. The coils are arranged and connected as a lap winding. The motor, which was made by the General Electric Co., Schenectady, N. Y., has a squirrel-cage rotor. The coils are connected in one Y circuit, there being two coils per group with 109 turns of No. 20 double-cotton-covered wire per group. The winding pitch is from 1 to 6.

Will someone draw a diagram illustrating the direction of curren flow in the windings described above? Considerable trouble is being experienced with heating. It is believed that some of the coils are bucking each other. The full-pitch winding of this motor would be from 1 to 7.—R. J. B., Racine, Wis.

No. 517.—Refinishing Brass Tubing.—Can someone give a good and practical method of refinishing brass tubing and fixture parts? The tubing which I have under consideration at the present time is corrugated.—A. S. N., Plymouth, Mass.

No. 518.—Use of Current Transformers.—Will someone please explain why current transformers are used in connection with a-c. ammeters instead of shunts? I presume that it is due to an ununiform reactance in the instruments with different current values. Am I correct, and are there any other reasons such as skin effect in the shunt or safety? Are shunts ever used, or were they ever used with a-c. ammeters?—J. B., New York City.

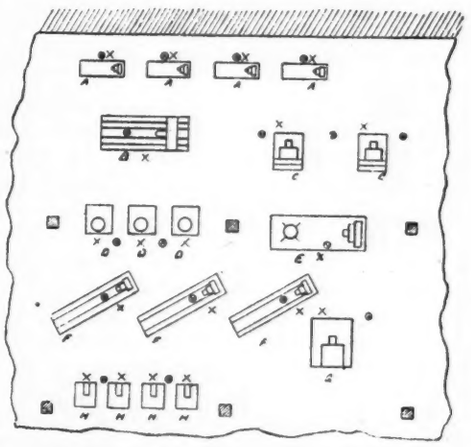
No. 519.—Protecting Transformer Poles Near School Buildings.—In the safety-first meetings of the company where I am employed the matter of protecting transformer banks near school buildings has been brought up. The proposition is to determine what protection is required to prevent accidents that might result from children climbing the poles. What precautions are taken by other companies to guard against such accidents?—C. W. B., Enid, Okla.

No. 520.—Design of Windings for Induction Motors.—Will someone give formulas and examples for determining the proper size of wire and number of turns to be used in winding one, two and three-phase induction motors to operate on 25, 50 and 60-cycle lines at from 110 to 500 volts?—S. M. C., Quebec, Canada.

Answers.

No. 514.—Illumination of a Machine Shop.—What is the best method to employ and what intensity in foot-candles should be used in lighting a fairly large machine shop? The shop in question is 50 by 200 ft. in size and has a saw-tooth roof with windows all along both sides and the ends. Drill presses, planers, shapers, saws, milling machines and other tools all have individual motors so that there are no belts to interfere with overhead installation. Should a system of general illuminating be installed, or would a mixed system of general and local lighting be better or cheaper? What special provision should be made for the work benches along the sides of the shop? If general illumination is best, what intensity should be used and what size lamps would give the best results?—N. S. T., Detroit.

Answer.—In lighting a machine shop of the type in question the best and most advisable system is one of localized general illumination, locating the units with respect to the machines and at the same time hanging them approximately 9 ft. from the floor. This arrangement permits



Section of Shop Lighted by a Localized General System.

a multiplicity of light sources for any particular machine, produces the highest intensity with the least shadows on the work and produces safe bright aisle and floor areas.

In most cases this system results in rows of units down the length of the building as the machines are usually located in that manner. An intensity of from 8 to 16 foot-candles is recommended, depending upon the fineness of the machining. The higher intensity for fine work may be obtained by using 200-watt, bowl-enameled, Mazda C lamps and RLM standard dome reflectors. The lower intensity would require 100-watt, bowl-enameled, Mazda C lamps and RLM standard dome reflectors. In both cases it is understood that the units will not be hung more than 12 ft. apart.

Where there is liable to be internal boring individual local lights on adjustable arms may be fastened to the machine, but in other cases it is not advisable to employ local lighting due to direct and reflected glare.

The accompanying sketch illustrates the location of outlets and position of the operator (x) in a typical machine shop lighted by the localized general method. Benches along the walls may be

well lighted by using the RLM standard dome reflector and bowl-enameled Mazda C lamps hung 6.5 ft. high and 8 ft. apart in a row about 4 ins. in from the outer edge of bench. If 16 foot-candles of illumination is desired for fine work 150-watt lamps will be required, while the 75-watt size will be necessary to produce 8 foot candles for rough work.

These calcualtions are based on the assumption that the plant is painted with white side walls and ceilings. A small factor has also been allowed for depreciation due to dust and dirt collections. It should be remembered that the intensity of illumination falls off rapidly with a small collection of dust on the reflector and lamp equipment. —A. S. T., Harrison, N. J.

Answer.—As no ceiling height was given one of 12 ft. was assumed, this height being one ordinarily used with 1-story shops of sawtooth roof construction. This low height precludes the use of high-wastage lamps spaced widely apart if an even distribution is desired. A medium intensity of general illumination supplemented by local lamps on machines requiring such lamps is the most economical method of lighting such a shop consistent with safety, freedom from eye strain, and general comfort.

For the proper design of a localized general system a plan showing the exact location of machines in detail would be required. The general lighting employs 100-watt bowl-enameled lamps in RM standard dome reflectors, spaced on 10-ft. centers and hung 10-ft. above the floor. The intensity given is approximately 5 foot-candles. Local lighting of machines should be taken care of by 25-watt all-frosted Mazda B lamps in deep-bowl aluminum-finished reflectors, mounted on a movable bracket arm. Bench lighting is accomplished by 150-watt Mazda C bowl-enameled lamps in RLM standard dome reflectors mounted on 10-ft. centers suspended 10 ft. high and 2 ft. from the wall. The irregularity in spacing between the outside row of 150-watt lamps and the 100-watt lamps is compensated for by the increased wattage of the lamps over the bench. The intensity on the benches is approximately 7.5 foot-candles. Should the spacing for the general lighting system be impractical on account of the overhead construction an even-foot spacing can be resorted to, such as 12 by 12 ft., 14 by 14 ft., etc. In the event of the spacing exceeding 12 by 12 ft., 150-watt, bowl-enameled Mazda C lamps should be used throughout. The mounting height should also be increased if possible.—J. H. K., Harrison, N. J.

BOOK REVIEWS

"Elementary Lessons in the Mathematics of Electricity." By R. W. Kent. Minneapolis: The William Hood Dunwoody Industrial Institute. Paper, 72 pp. (9 ins. by 6 ins.) with illustrations. Supplied by Electrical Review Publishing Co., Inc., for $1.

This book comprises a series of 15 lessons in the practical mathematics of electrical work. The material is prepared for the study and use of the practical journeyman and others connected with the business who need an elementary understanding of the mathematics of the craft. The multiplication and division of fractions, decimal fractions, powers and roots, wire and wire tables, the metric system, reading and plotting curves, ratio and proportion, simple algebra and other subjects are taken up in the various lessons.

"The Thermoionic Vacuum Tube." By H. J. van der Bijl. New York: McGraw-Hill Book Co., Inc. Cloth, 391 pp. (9 ins. by 6 ins.) with 232 illustrations. Supplied by Electrical Review Publishing Co., Inc., for $5.

In this work the author has endeavored to present the principles of operation of thermionic vacuum tubes, and to co-ordinate the phenomena encountered in a study of this field. Such a procedure results in a more valuable book than simply a detailed description without proper co-ordination of the many investigations that have been published on this subject. The treatment is sufficiently elementary to meet the demands made on a book of this kind. This is especially the case with the first few chapters, which must be regarded as very elementary and mainly intended for those who are interested in the applications of thermionic tubes, but are not sufficiently acquainted with the properties and behavior of electrons to understand the operation of these tubes.

The book is divided into ten chapters, the first three chapters dealing with the properties of electrons and their dislodgment from vapors, gases, and solids. The next two chapters deal with the physics of the thermoionic valve and the influence of gas on the discharge. Rectification of currents, amplifications, oscillation generation, modulation and detection of current and miscellaneous applications are covered in the last five chapters. This book is well prepared and gives a good presentation of the present developments of the thermoionic vacuum tube. It would make a valuable addition to any technical library.

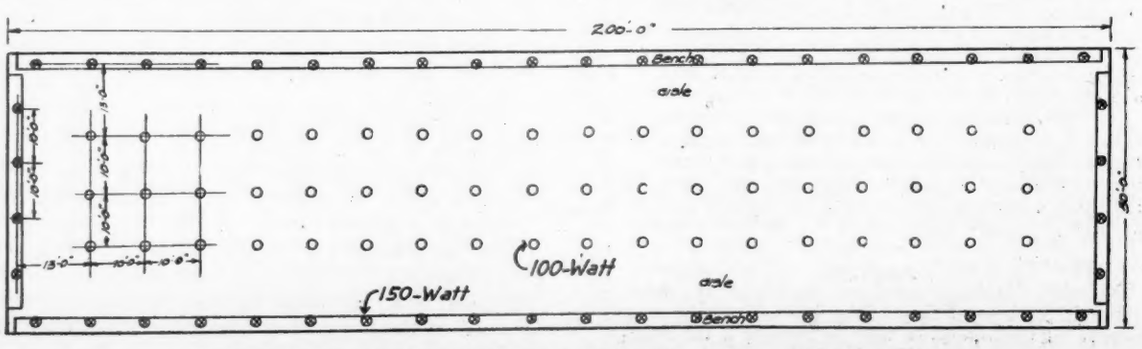


Diagram Showing Spacing of Lamps for Proper Illumination of Machine Shop.

NEW APPLIANCES

Newly Developed and Improved Electrical and Mechanical Apparatus, Appliances, and Devices Now Being Placed on the Market

Adjustable Color Filter for Window Lighting Reflector.

In order to enable the valance or transparent sign of a show window to be lighted with white light while the merchandise on display is illuminated with colored light, the Holophane Co., 340 Madison avenue, New York City, has developed a color filter for use with its window-lighting reflector No. 922. This attachment is made in all colors and so designed to clip on the lower edge of the reflector that it may be easily put on or taken off and permit the desired effects to be obtained. During the Christmas

Equipment for Producing Colored Window-Lighting Effects.

holidays several New York electrical merchants used red and green filters to secure appropriate decorating effects in their window displays and thereby produced some attractive and pleasing results.

Motor-Driven Oil Burner for Hot-Air Furnaces.

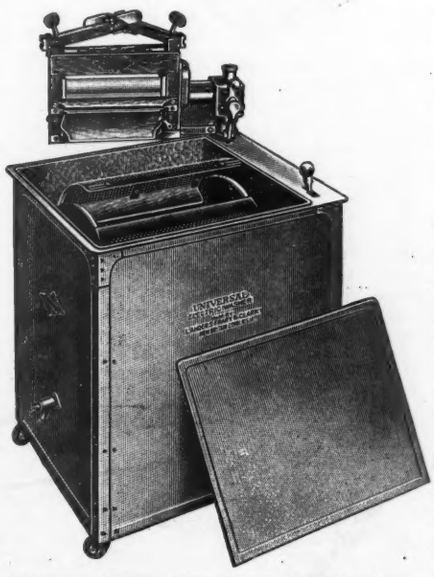
An oil burner that can be installed in a hot-air furnace has been placed on the market by the Atwood Manufacturing Co., Minneapolis, Minn. To install the burner the grates of the furnace are covered with brick and fire clay, leaving a hole about 4 ins. in diameter in the center of the firebox where the burner head is attached to the grate. The clay is molded in the shape of a saucer, extending upward and outward from the 4-in. opening. Oil is fed into this saucer-shaped space through a hollow shaft with a fan at the top. The fan, driven at a speed of 3500 r.p.m. by an electric motor, breaks the oil up into fine particles and mixes it with air to aid in combustion.

The motor is mounted on a separate base and connects to the fan shaft by a belt running through the ash door. It is controlled electrically by a thermostat. The oil-supply valve is controlled by the rotation of the fan, so that when the motor is started the valve is opened and when the motor is shut down the oil valve is closed. On starting the oil is ignited by a pilot flame which burns continuously.

"Universal" Electric Washer.

Landers, Frary & Clark, New Britain, Conn., has placed on the market a clothes washer of the fully inclosed cabinet type. It has a galvanized tub with a drain cock outside the cabinet. The washing cylinder is 18.5 ins. long, 18 ins. in diameter and is made of zinc perforated with a large number of small holes. The cylinder revolves twice one way, then reverses and revolves twice in the opposite direction, making 18 complete revolutions each minute. This action is said to combine the advantages of both the revolving and oscillating types of washers. When not operating the cylinder automatically locks in position with the opening at the top. There are five maple lifters on the inside of the cylinder which carry the clothes up until they fall back of their own weight into the hot suds. The action of hot suds working through the clothes as they fall washes out the dirt.

Transmission of power from the motor to the washing cylinder and wringer is accomplished through a set of cut



Clothes Washer With Reversing Cylinder.

gears completely inclosed and running in oil. There is an automatic clutch on the drive shaft so that if the wringer rolls become clogged the power will be cut off from the cylinder and wringer. As soon as the overload is released the washer will start again.

The wringer has 12-in. vulcanized-rubber rolls 1.75 in. in diameter and provided with a safety pressure-release lever. There are four positions in which the wringer can be locked and operated, and it cannot be operated except in one of the locked positions. The wringer bearings are made of hard maple boiled in tallow and are said to require no oiling.

The washer measures 36 ins. high to the top of the tub, occupies a floor space of 24 by 30 ins., and has a capacity of six sheets.

A "Make-Ur-Own" Battery Package for Standard Batteries.

A package, known as Package No. 6404, Jr., and containing the materials to make one standard 2-in. battery,

Package for Making a Standard 2-in. Battery.

is being marketed by the Stuart Products Corp., Chicago. The regular size of the package is 4 ins. by 1⅜ ins. by 2⅜ ins. It is convenient for motorists inasmuch as the package can be thrown into the tool box and left there until a new battery is needed. There is said to be no deterioration because the parts are not mixed.

Trickling-Charge Rectifiers for Use With Batteries.

The floating of small signal batteries has proven so successful with the trickling-charge rectifiers made by the Valley Electric Co., St. Louis, that a demand has arisen for a similar means of charging 110-volt interlocking batteries and other higher-voltage and higher-discharge systems. Valley motor-generator sets have now been designed especially for this class of service. The requirements are for a machine that will stand continuous duty 24 hrs. daily and 365 days per year with a minimum of attention and wear, and at the same time be as efficient as consistent with rugged design. The several possible wearing parts in machines of this nature are the bearings, commutator and carbon brushes. Valley machines employ double-ball self-aligning bearings mounted between heavy filtering pads that maintain lubrication for four to six months, and give a bearing life of approximately seven years or more, while the oversize commu-

tator is made of hard-drawn copper, and the brushes are also chosen for long life, according to the claims made.

These machines are equipped with the squirrel-cage type of induction motor that has no commutator, brush rigging or other parts to get out of order, these motors being furnished as desired for operation on single, two and three-phase circuits of 110, 220 or 440 volts and 25 to 60-cycle frequency. The usual 55-cell, 60-cycle single or polyphase-circuit type is arranged for 150 volts direct current. Other sizes and types are also supplied to meet the desired requirements.

National X-Ray Fixtures to Be Exhibited at Buffalo.

At the Buffalo Lighting Fixture Market to be held next week the National X-Ray Reflector Co., Chicago, will show X-Ray indirect lighting fixtures, some

Typical X-Ray Indirect Lighting Fixture.

with solid opaque bowls and others with the same type of X-Ray reflectors as in the other indirect lighting fixtures, but with the addition of glass panels in the bowls, softly lighted so as to eliminate all glare. In addition to these fixtures the company will have on exhibit in its booth No. 75 the X-Ray one-pieced silvered show window reflectors and industrial lighting reflectors.

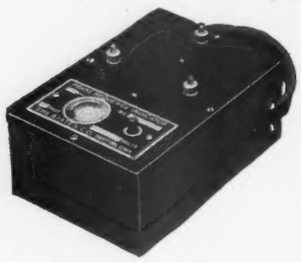
Indicator to Determine Phase Sequence.

The "Phase Sequence Indicator" made by the States Co., Hartford, Conn., if connected to a polyphase circuit, will show the order of succession in time of the e.m.f. waves in the individual phases. Information of phase sequence is important when paralleling generators, connecting induction motors, changing lines and services supplying induction motors, connecting reactive-component meters, using phase shifters, testing meters at fractional power-factor by taking current and potential from different phases, and in other cases. Accidental reversal of a motor through changes in supply may be avoided by the use of a phase-sequence indicator.

A phase sequence indicator shows the order of succession by the relative brightness of a small incandescent lamp. If the sequence is counter clockwise the lamp will glow brightly; if the sequence is clockwise the lamp will be dim. This result is accomplished by means of a small polyphase transformer of peculiar characteristics, having a single secondary winding in which the current strength depends upon the order of succession in time of the supply e.m.fs. A reversal of any phase of the supply will change the value of the secondary current and, therefore, the brightness of the lamp.

The indicator includes a small transformer, a low-voltage lamp with a reflector and lens, and a reversing switch, all of which are mounted in a neat wooden case with a polished insulated top on which are mounted the binding posts for attachment of the supply wires. A convenient carrying handle is provided. As there are no moving parts other than the switch and button, the indicator is rugged and not easily injured. It may be safely entrusted to linemen who have frequent occasion to use them.

The indicators are so connected at the factory that when the phase se-



Device to Determine Phase Rotation in Alternating Current Circuits.

quence of the supply is counter clockwise, with reference to the arrangement of the binding posts, the lamp will be bright if the button operating the switch is not pressed. Pressing the button under this condition will cause the lamp to be dimmed. The purpose of the switch is to make it possible for the observer to make a reversal of one phase quickly so that there can be no uncertainty as to the degree of brightness of the lamp. If, on pressing the button, the lamp becomes brighter then the order of phase sequence is clockwise.

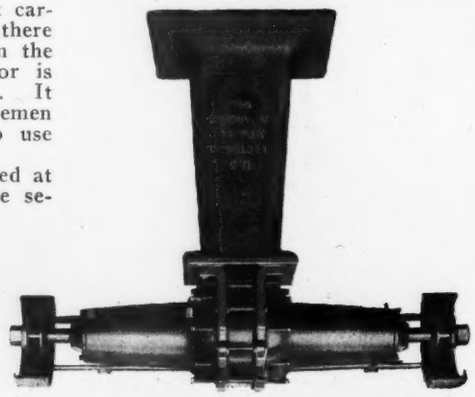
Portable Tool With Flexible Shaft and Hand Chuck.

Heavy-Duty Electric Buffer.

The U. S. Electrical Manufacturing Co., Los Angeles, Cal., has recently completed the development of a new heavy-duty "Johnson" electric buffer having an over-all shaft extension of approximately 6 ft., so that two men can work on the machine at the same time without interfering with each other. This buffer can be built in a number of different sizes for 2 or 3-phase alternating current, the 5-hp. 3600-r.p.m. machine being the most popular size.

Large deep grooved ball bearings are used on these machines, one set of bearings being placed at the end of the housings with another set at the center of the machine to prevent periodical vibrations of the motor.

Although designed in collaboration with the engineers of a rubber company as a buffer for pneumatic truck tires, the machine has proven ideal for many



Electric Buffer With Long Shaft.

purposes. It is being used in plating plants, radiator works, sheet metal works, and, in fact, is adaptable for use wherever a heavy-duty buffer is required.

Motor-Driven Hand Tool Used for Many Purposes.

A 0.1-hp. motor is used in connection with a flexible shaft to drive various tools and devices in drilling, grinding and buffing outfit being marketed by the Racine Electric Co., Racine, Wis. The motor has a speed range of from 2000 to 10,000 r.p.m. with a normal speed of 5000 r.p.m. The tool may be operated from any light socket, the motor being suitable for either direct or alternating-current service.

The uses of such a device are numerous, and many applications can be made in either the shop or the home. The hand chuck will take tools ranging in size up to 0.25 in., and grinding of any kind may be done on the wheel by persons with little or no experience in such work.

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

Universal Motor Co., Oshkosh, Wis., has issued bulletins 17, 18, 29 and 30, descriptive of its 3-in. centrifugal pumping outfit; 4-cylinder, 4-cycle stationary engine; marine motors, and 4-kw. generating set, respectively.

Frank D. Chase, Inc., Chicago, engineer, has issued a booklet, entitled "Factories That Fit," which illustrates the company's conception of engineering design in factory construction. The booklet contains photographs of 40 factories in various parts of the country designed by the company.

Schimmel Electric Supply Co., 318 Market street, Philadelphia, manufacturer of electrical specialties, has acquired the 6-story building at 526 Arch street for early occupancy. The new acquisition will allow for increased capacity.

Mueller Electric Co., 2135 Fairmount road, Cleveland, has announced that it now has a wire type of storage-battery handle, known as No. 7-A, ready for the market. These are lead-coated to protect them from the acid, the company claiming that such coating offers protection to the metal because it is not porous as is lead-plating.

Bryant Electric Co., Bridgeport, Conn., has announced the appointment of Robert M. Eames as general sales manager to fill the vacancy caused by the resignation of Frank V. Burton. Mr. Eames has been active in the sales organization of the company for 15 years, and for the last few years has made a remarkably good record as its export manager.

Frank D. Chase, Inc., Chicago, has published in the January issue of its house-organ, entitled, "Industry," an article by Mr. Chase on the subject of "The Employer's Analysis of an Engineer." The author places loyalty first, with personality as a second classification, experience third and education fourth, all of which are essential. L. M. Hansen's article on "How to Get a Foundry That Fits," includes data and typical layouts for malleable, gray iron and steel foundries, with dimension of yards, melting equipment, molding area and core rooms.

Combustion Engineering Corp., 11 Broadway, New York City, has announced the opening of a branch office at 521 Candler building, Atlanta, Ga., in charge of A. A. Hutchinson, who has had an extensive experience in the engineering field in the South. The Potomac Electric Power Co., which operates a number of power stations in the vicinity of Washington, D. C., employed him as a construction engineer and superintendent of the underground testing department, in which capacity he assumed full charge of several substations, later being given charge of the entire testing department. Mr. Hutchinson's knowledge of the designing, equipping and operating of power plants will be useful in taking care of stoker prospects and users with whom he will come in contact in his new capacity.

Conveyors Corp. of America, 326 West Madison street, Chicago, has announced that E. D. Kellogg has been appointed New Jersey representative to handle the "American" trolley carrier and the "American" steam jet conveyor in the northern half of the state, with headquarters in the company's eastern office at 110 West 40th street, New York City. Mr. Kellogg was graduated from the Stephens Institute of Technology in 1898, and specialized in the design and construction of steel structures until 1916, when he entered the material-handling field with the Terry Manufacturing Co., New York City, manufacturer and builder of heavy derricks and traveling cranes. Before joining the Conveyors Corp. of America, Mr. Kellogg was connected with the Dravo Contracting Co., Pittsburgh.

Maring Wire Co., Muskegon, Mich., manufacturer of enameled and cotton-covered magnet wire, has announced the appointment of the R. W. Lillie Corp. as its eastern representative. The New York City office at 30 Church street is in charge of R. W. Lillie and includes the following personnel: Lee Skipwith, R. S. Edwards, E. M. Smith and W. F. Collins. The Boston office at 176 Federal street is in charge of H. D. Steele, with R. M. Simpson as his assistant.

Roller-Smith Co., 233 Broadway, New York City, has announced the appointment of the J. E. Dilworth Co., 493 South Main street, Memphis, Tenn., as its representative to handle the Roller-Smith products, consisting of electrical measuring instruments, meters and circuit-breakers, in the western half of Tennessee, the eastern half of Arkansas and the northern half of Mississippi. The electrical department of the Dilworth company is in charge of E. M. Gresson, who was formerly associated with Fairbanks, Morse & Co., and the Sanborn Electric Co., Indianapolis, Ind.

Rumsey Electric Co., 1007 Arch street, Philadelphia, electrical supplies and machinery jobber, has issued a 32-page booklet which presents to its customers and friends an idea of the scope of the business and the personnel of the Rumsey organization. Halftone illustrations of the officers and employes are shown, together with photographs of the various departments. At the end of the booklet views of several plants producing electrical equipment handled by the Rumsey company are shown.

Gordon D. Wilson has announced that he has succeeded to the electrical jobbing business of George T. Westcott & Co. carried on at 645 Washington boulevard, Chicago, and will continue to represent the following mills at the same address under his own name: Scranton Button Co., receiver shells and mouthpieces, composition socket bushings, moulded insulation and specialties; Triangle Conduit Co., "Triduct" flexible nonmetallic, "Tricord" portable conductor for hard service, flexible armored cable and flexible steel conduit; Dongan Electric Manufacturing Co., bell-ringing transformers, ammeters and toy transformers; Fibro Products Co., electrical and mechanical tubes, finished and unfinished candles, lacquered and japanned tubes; Scranton Glass Instrument Co., battery thermometers, battery hydrometers and laboratory glassware; D. M. Steward Manufacturing Co., Lavite insulators.

National Metal Molding Co., Pittsburgh, has issued a hand-book containing full instructions for installing "National" metal molding under all conditions. It also lists the various "National" fittings, devices, etc., that are used in connection with metal molding. Owing to its small size the book can be conveniently carried and used on the job.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, has issued folder No. 4448, entitled "Do Your Chores Electrically," describing its 32-volt power stand. This folder includes a mailing card, which can be imprinted with the name of the dealer. The many uses of this power stand are also illustrated.

C. L. Warrick Co., New York City, dealer in electric lamp specialties, has announced its removal to more spacious quarters at 112 West 42nd street.

Allis-Chalmers Mfg. Co., Milwaukee, has issued bulletin No. 1113 applying to its single-phase repulsion motor, which it is just placing on the market.

Novelty Lamp & Shade Co., Cleveland, manufacturer of art lamps, shades, portables, floor lamps and lanterns, has issued catalog No. 37 covering its line of porch lights, wall brackets and pendants, portable table lamps and boudoir lamps.

Standard Underground Cable Co., Pittsburgh, elected the following officers at the annual meeting of the company: Joseph W. Marsh, president and general manager; Philip H. W. Smith, vice-president and assistant general manager; J. C. Marsh, C. C. Baldwin and C. W. Davis, vice-presidents; Charles M. Hagan, treasurer, and John W. Shibler, secretary.

Star Candle Lamp Co., New York, will erect a plant at 1-9 Bethune street, for the manufacture of metal lighting fixtures.

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

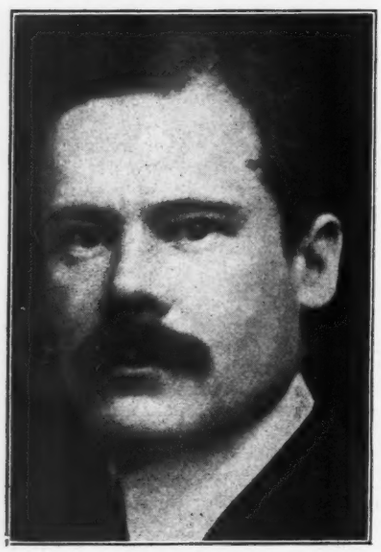
F. A. WILLIAMS has been elected to succeed Fred G. Butchel as chairman of the Public Service Commission of Oregon.

JAMES R. WERTH, West Penn Power Co., Pittsburgh, has been appointed commercial service manager of the company.

FRANK J. DUFFY, Natchez, Miss., has been elected chairman of the board of water commissioners. Mr. Duffy is president of the Southern Railway & Light Co.

GEORGE E. SANFORD has been elected president of the American Society of Safety Engineers. Mr. Sanford is connected with the General Electric Co. at West Lynn.

E. F. W. ALEXANDERSON, who was recently elected president of the Institute of Radio Engineers, is chief engineer of the Radio Corp. of America. He was born at Upsala, Sweden, Jan. 25, 1878, and was educated at the high school and university of Lund and the Royal Institute of Technology, Stockholm, later completing a post-graduate course at Berlin. In 1901 he entered the service of the C. & O. Electric Co. and the following year joined the General Electric Co.'s organization. During the visit of William Marconi to Schenectady, N. Y., in May, 1915, Mr. Alexanderson came in contact with the noted inventor and as a result the Alexanderson large radio frequency alternator and magnetic amplifier for radio telephonic



E. F. W. Alexanderson.

work was installed in the New Brunswick (N. J.) station of the Marconi Co. It has now been adopted by that company and the Radio Corp. of America. Mr. Alexanderson holds a number of United States patents and was the first to introduce iron into the manufacture of high-frequency circuits. He originated the development of larger alternators and the magnetic amplifier which are today most effective in long-distance radio transmission. He is a member of the American Institute of Electrical Engineers, a fellow of the Institute of Radio Engineers and the author of the "Dielectric Hysteresis at Radio Frequencies," "A Magnetic Amplifier for Radio Telephony," "Simultaneous Sending and Receiving," "Transoceanic Radio Communication," "Central Stations for Radio Communications," and other technical articles.

M. W. BETTERIDGE, operator, San Joaquin Light & Power Corp., has recently been transferred to the company's new substation at Merced.

A. B. CORYELL, who was formerly connected with the Burke-Fowler Electric Co., Alma, Mich., has been appointed superintendent of power of the Laurel Light & Power Co., Laurel, Miss.

WILLIAM B. GREGORY has been elected president of the American Society of Mechanical Engineers to succeed the late John B. Allen. Mr. Gregory is professor of experimental engineering at Tulane University, New Orleans, La.

HENRY HINE and MISS ELEANOR HAMMER were married in New York City Wednesday, Feb. 2. Mr. Hine is widely known in electrical circles, both in the manufacturing and operating fields, and has extensive interests in power and lighting companies in Mexico. After a trip to Colorado and Mexico Mr. and Mrs. Hine will return to New York City to reside.

ROBERT R. MCCOY, superintendent of the Illinois Traction System, Staunton, Ill., has resigned that position to enter private business at Oklahoma City, Okla. J. H. Morris, recently stationed at Mackinaw, Ill., will succeed him. O. C. Genung, former terminal trainmaster in Springfield, has been appointed superintendent of the northern division of the Illinois Traction System, with headquarters at Mackinaw. S. P. Sheibley, former chief dispatcher at Decatur, Ill., succeeds Mr. Genung as terminal trainmaster at Springfield.

DR. R. C. RODGERS, who has recently been appointed assistant secretary of the Illuminating Engineering Society, New York City, will give his attention to the promotion of its interests and expanding its activities and influence. He will assist the chairman of committees, where possible, in the details of their work and will endeavor to increase the membership of the Society. Until the time of his affiliation with the Society Jan. 17, he served for 15 years in the Department of Physics of Cornell University, from which he graduated in 1905 with the degree of M. E., and through advanced work obtained the degree of M. A. and PhD. He has been particularly interested in photometry and illumination for some years past and while at Cornell had charge of several courses in physics, giving lecture, recitation and laboratory work. Since the retirement of Dr. Edward L. Nichols as head of the physics depart-

Dr. R. C. Rodgers.

ment, he has been in charge of the work in the physics of photography, further developing the courses originated by Prof. G. S. Moler, who retired in 1917. Dr. Rodgers is a member of the American Physical Society, the American Association for the Advancement of Science, the Optical Society of America, the American Institute of Electrical Engineers, the Illuminating Engineering Society, the Cornell Engineering Society, and other organizations.

OBITUARY.

CHARLES E. CHAPIN, president and treasurer of the Charles E. Chapin Co., 201 Fulton street, New York City, died Jan. 29 at his home in Field Point road, Greenwich, Conn.

W. G. AINSLEY, superintendent of the Central Illinois Public Service Co., Paris, Ill. was killed by a live wire Jan. 30. Mr. Ainsley had been superintendent of the Paris property of the Illinois Public Service Co. for 6 mo., and previously lived in Mattoon, Ill.

DONALD BOWMAN, engineer of apparatus and materials, Commonwealth Edison Co., Chicago, died at the home of his sister in Mitchell, S. D., Tuesday, Jan. 18. Mr. Bowman entered the service of the company as an assistant draftsman in June, 1907, at the start of the summer vacation. He returned to the Massachusetts Institute of Technology in the fall of that year, completed his course and returned to the drafting room in June of the next year and remained there until last October. He was a member of the A. I. E. E., the W. S. of E., the Electric Club and the Edison Club.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES.

Albany, N. Y.—The Iroquois Utilities, Inc., 514 City Bank building, Syracuse, N. Y., has been authorized by the New York state public service commission to issue $145,500 in 7% bonds, to net proceeds of $139,950. Of this amount $83,301 is to be used in the construction of a hydroelectric plant in the Cattaraugus creek, Gowanda, N. Y., and the balance to pay short term notes.

Brooklyn, N. Y.—Considerable electrical equipment, refrigerating machinery, etc., will be installed in the ice-manufacturing plant to be erected by Rubel Brothers, Glenmore avenue, on Tilden avenue, near Flatbush avenue, estimated to cost about $500,000, including machinery.

Carthage, N. Y.—The Northern Development Syndicate is planning for the construction of an ore reduction plant, to include electric furnace installation and kindred operating equipment.

Central Islip, N. Y. — Electrical equipment, refrigerating machinery, etc., will be installed in the addition to be erected at the Central Islip state hospital by the State Hospital Commission, Albany. The work is estimated to cost about $100,000.

Fallsburg, N. Y.—The Mountain Dale Electric Light & Power Co., Mountain Dale, N. Y., has petitioned to the New York state public service commission, for permission to construct an electric lighting plant and to exercise franchise therefore.

New York, N. Y. — Considerable electrical equipment will be installed in the theater building to be constructed by Bramhall Players on East 27th street, including dome lighting, revolving stage facilities, etc. It is proposed to inaugurate construction late in the spring.

North Tonawanda, N. Y.—Electrical equipment, pumping machinery, etc., will be installed in the proposed filtration plant to be constructed by the city, with capacity of about 8,000,000 gals. City Engineer Carl L. Oelkers is in charge.

Ogdensburg, N. Y.—The New York & Ontario Power Co., care of Spratt & Van Kennan, attorneys, has applied to the Federal Power Commission for a preliminary permit to develop power on the St. Lawrence river from the eastern end of Murphy island to the eastern end of Lotus island.

Salem, N. Y.—Fred P. Lovejoy, Cambridge, N. Y., has made application to the New York public service commission for authority to construct an electric lighting plant in the Shushan lighting district in Salem, and for approval of the franchise granted by the town.

Bloomfield, N. J. — The Clark Thread Co., Clark and Ogden streets, Newark, N. J., has awarded a contract to the Salmond-Grimshaw Co., 526 Elm street, Arlington, N. J., for the erection of its proposed power plant and bleaching works on upper Broad street, Bloomfield, to cost in excess of $200,000. It is proposed to commence construction early in the coming spring.

Irvington (Newark), N. J. — The town commission is planning for improvements in the present street-lighting system for increased facilities. It is proposed to replace all 32-cp. lamps with 60-cp. units, and to make other extensions. The Public Service Electric Co. is furnishing the local service.

Seaford, Del.—Electric motors, and other electrical and mechanical equipment will be installed at the woodworking plant to be erected by Parsons Brothers on a site near the municipal limits, recently acquired. The structure will be 40 by 70 ft., with adjoining buildings, and is expected to be ready for service during March.

Wilmington, Del.—Electrical equipment, refrigerating apparatus and other mechanical equipment will be installed in the meat packing plant to be erected at the foot of Orange street by the Wilmington Provision Co. The plant is estimated to cost about $200,000. C. B. Comstock, 110 West Fortieth street, New York, is engineer. Max Matthes is president of the company.

Chester, Pa.—The Delaware County Electric Co. is arranging for the rebuilding of its one-story works at Front and Market streets, recently destroyed by fire.

Harrisburg, Pa.—Electrical equipment, refrigerating and ice-making machinery will be installed in the cold-storage plant to be erected by the American Cold Storage Co. on South Second street; it will be seven-story, reinforced concrete. John F. Feeser is president.

Philadelphia, Pa.—The board of estimate has approved an appropriation of $3,500,000 for the completion of the Frankford elevated railway line to be operated by the city, and for the purchase of electric and other equipment for operation. A fund of $500,000 has been approved for the installation of electrically-operated elevators in the city hall. The department of city transit, 1211 Chestnut street, will be in charge of the first noted fund.

Philadelphia, Pa. — The bureau of public health, City Hall, is planning for the erection of a one-story addition to its power plant at Thirty-fourth and Lombard streets. It is proposed to inaugurate work in the spring. C. L. Furbush is director.

Reading, Pa.—The Municipal Disposal Co., Easton, Pa., has tendered a proposal to the city council for the construction of an electrically operated filtration plant, with capacity of about 18,000,000 gallons of water per day; the total cost is estimated at $800,000. It is proposed that after a year of operation that the city purchase the plant.

Sayre, Pa.—The board of directors, Robert Packer Hospital, is planning for the installation of electric-operated pumping machinery at the waterworks, replacing present steam-driven equipment at the institution. Electric heating apparatus and other equipment will also be installed.

York Haven, Pa.—The York Haven Water & Power Co., is planning to secure service from the Harrisburg Light & Power Co. for local power and light distribution. As a result of an ice jam, diverting water from the mill race, the company is compelled to operate under reduced generating output.

Annapolis, Md.—The Bureau of Yards & Docks, Navy Department, Washington, D. C., has taken bids for extensions and improvements in the power house at the local navy works.

Baltimore, Md.—The Washington, Baltimore & Annapolis Electric Railroad Co. is arranging to take over and operate the Annapolis Short Line under a special agreement. The Short Line system is the property of the Maryland Electric Railways. George T. Bishop is president of the Washington, Baltimore & Annapolis system.

Washington, D. C.—The Bureau of Yards & Docks, Navy Department, has awarded a contract to G. B. Mullin & Co., 3303 Eleventh street, N. W., for the installation of an electric underground system, retaining wall, etc., at the local properties.

Washington, D. C.—The Idaho Power Co., care of M. C. Leighton, McLachlen building, has made application to the Federal Power Commission for a license to construct a 24-mi. transmission line from Blackfoot to Pocatello, Idaho.

Roanoke, Va.—The Norfolk & Western Railway Co. will electrify its coaling piers at Norfolk, Va., to include the installation of electrically-operated hoisting and conveying machinery, etc. Contract has been let to J. P. Pettyjohn & Co., 212 Eighth street, Lynchburg, Va., for the erection of the proposed power house at Radford, Va.

Tallahassee, Fla.—Harold Winter, care of W. W. Trammell, has made application to the Federal Power Commission for a preliminary permit to develop power in the Turkey creek at Turkey creek hill, near Valparaiso.

Dunn, N. C.—The city council has

plans in preparation for extensions and improvements in the municipal light and power plant. In connection with extensions in the city waterworks, the work will cost about $100,000.

NORTH CENTRAL STATES.

Ashtabula, O.—The city council will offer for sale $1,000,000 6% electric light bonds, authorized at the last general election.

Owosso, Mich.—The Kelley Construction Co., Eau Claire, Wis., will install a boulevard lighting system here, which will cost $15,000.

Attica, Ind.—The Attica Electric & Power Co. has filed notice of increase in capital from $50,000 to $100,000.

Columbus, Ind.—Electric service for street-lighting has been resumed by the Pulse & Porter Co., under an advanced rate granted by the public service commission last fall. Since September, due to controversy regarding rates between the municipality and company, the supply of energy has been discontinued.

Delphi, Ind.—John A. Shafer, 310 Oddfellows building, Indianapolis, is preparing plans for the Tippecanoe power plant to be constructed near Delphi. The plans as outlined, call for the construction of nine dams along the Tippecanoe river and at each of these dams electric substations will be erected.

South Elgin, Ill.—The municipal electric lighting plant will be improved, for which $50,000 will be expended. Attorney Frank A. McCarthy is in charge.

Augusta, Wis.—The Augusta Electric Co. has been incorporated with a capital stock of $50,000. The incorporators are R. W. Bowen, L. A. Van Shaver and L. J. Roberts.

Beloit, Wis.—The county board has granted a franchise to the Wisconsin River Power Co., to extend its lines. Under the terms of this franchise, the electric lines will proceed from the company's substation at Stoughton through Oregon and Brooklyn villages to Evansville. Villages and farmers along the way will be supplied with power originating at Prairie du Sac and coming to Stoughton via Madison.

Sparta, Wis.—Fire damaged the power and lighting plant of the Wisconsin-Minnesota Light & Power Co. R. S. Rodenuis is manager.

Arnold, Minn.—The residents of the town have decided to have electric lights, and will pay for the installation of poles to get light service. L. H. Young is president of the Arnold Welfare Club.

Nashwauk, Minn.—An election will be held to vote on the question of issuing $50,000 in bonds, for water and light improvements.

Jefferson City, Mo.—The Missouri Water Co. has been organized with a capital stock of $550,000, to generate electric power by the construction of a dam on the Niangua river. The dam will be located near Linn creek and will generate power to be used by towns in that section and may probably be brought to this city for use here. Sid C. Roach, Linn creek, is in charge.

Lamar, Mo.—W. R. Banks and associates have made application for permission to utilize waters of the Osage and Niangua rivers for the installation of a hydroelectric generating plant. A transmission and distributing system will be constructed to furnish service to points in the central part of the state.

Warrensburg, Mo.—F. L. Wilcox, consulting engineer, St. Louis, is preparing plans for a municipal light plant for Warrensburg.

Hillsboro, Kan.—Bonds in the sum of $60,000 have been voted for extensions and improvements to the municipal lighting plant.

Wakpala, S. D.—The electric lighting plant here was recently destroyed by fire.

SOUTH CENTRAL STATES.

Germantown, Tenn.—The town council is planning for the installation of a municipal power plant in connection with a waterworks system. Gaines & Carlisle, 206 Falls building, Memphis, Tenn., are engineers.

Gadsden, Ala.—The Alabama Power Co. has plans under way for the construction of an electric power line from Gadsden to a point on the Alabama-Georgia state line, Cherokee county, about 52 miles. Connection will be made with another transmission system here for an interchange of power. Thomas W. Martin is president.

Hardy, Ark.—The Mammoth Spring Light & Power Co. will furnish electric lighting here.

Mountain View, Okla.—W. T. Parnell and Albert Moriss have been appointed to consider ways and means for enlarging the municipal lighting plant.

Ballinger, Tex.—A municipal lighting plant will be erected here. Mayor Guin is in charge.

Dallas, Tex.—The Winchester-Texas Oil & Refining Co. is planning for the construction of a power plant at its oil properties in the Sipe Springs district, for general operations. William L. MacKay, production manager, is in charge.

Harlingen, Tex.—The city council has arranged for a bond issue of $60,000 for the installation of a municipal power plant in conjunction with a waterworks system.

WESTERN STATES.

Shoshoni, Wyo.—The Wyoming Power Co. has made application to the Federal Power Commission for a license to construct a dam and reservoir, conduit, power house and transmission line.

Phoenix, Ariz.—The Pacific Gas & Electric Co. has made application to the Federal Power Commission to construct a 67-mi. transmission line, connecting to existing lines of the company in Yavapai and Maricopa counties.

Provo, Utah.—C. E. Loose has made application to the Federal Power Commission for license to construct a dam, reservoir, conduit, power house and transmission line, East Walker river, Mono county, California.

Ellsburg, Wash.—The Kittitas Light & Power Co. has been incorporated with a capital of $360,000. Eugene E. Wagner is trustee.

McGowan, Wash.—H. S. McGowan has applied to the Federal Power Commission for a preliminary permit to develop power on the Deschutes river.

Milton, Wash.—The electric light and power plant here was recently destroyed by fire. B. J. Rainey, proprietor, is making arrangements to install a new plant.

Seattle, Wash.—Maurice D. Lechey, 620 Alaska building, has made application to the Federal Power Commission for a preliminary permit to develop power at Beaver Falls and Lake Mahoney, near Ketchikan, Alaska.

Spokane, Wash.—The Spokane & Eastern Railway & Power Co. and the Spokane Traction Co. will expend $151,000 for improvements and replacements during 1921. F. E. Connors is general manager.

Bandon, Ore.—The citizens will be asked to vote soon on a proposal for the building of a hydroelectric plant, and for the purchase of the Bandon Power Co. distribution system and plant.

Pendleton, Ore.—Plans have been prepared for the building of a $25,000,000 dam and power site at Umatilla rapids, to furnish power to the entire district and irrigate 558,300 acres in Umatilla, Morrow and Gilliam counties, and corresponding territory on the Washington side of the river. D. C. Brownell, Umatilla, Ore., is in charge.

Portland, Ore.—The Portland Railway, Light & Power Co. has made application to the Federal Power Commission for a preliminary permit to construct a dam, reservoir, conduit and power house in Oak Grove, on the Clackamus river, Oregon.

Roseburg, Ore.—The Douglas County Light & Water Co. has been reorganized, and will make some improvements to its plant, which has been under construction for some time.

Fresno, Cal.—The San Joaquin Light & Power Corp. plans to increase the amount of its capitalization from $25,000,000 to $150,000,000. A meeting will be held Feb. 24 for the purpose of voting this increase.

Los Angeles, Cal.—The San Joaquin Light & Power Corp. plans to increase its total authorized stock from $25,000,000 to $150,000,000, at its annual stockholders' meeting Feb. 24.

San Francisco, Cal.—Mary Ives Crocker and J. W. Preston, Jr., 350 Post street, have made application to the Federal Power Commission for a preliminary permit to construct a dam, conduit, reservoir, power house and transmission lines on the north fork, Mokolume river, Amador county.

San Francisco, Cal.—The California-Oregon Power Co. has applied to the railroad commission for an order ap-

proving the reorganization plan proposed by a bondholders' committee. In addition the company asked that the new company formed as a result of the recommendations of the bondholders' committee be authorized to create a bonded indebtedness of $10,000,000 to secure funds to meet the cost of necessary extensions and betterments, and to meet underlying bond issues as they mature.

San Francisco, Cal.—The Southern Sierras Power Co., care of W. L. Huber, First National Bank building, has applied to the Federal Power Commission for a preliminary permit to divert water from the north fork to south fork of Whitewater river; second diversion dam and 12-mi. conduit to power house on main river, conduit to second power house on White water river in San Bernardino and Riverside counties.

San Francisco, Cal.—The Southern Sierras Power Co., care of W. L. Huber, First National Bank building, has applied to the Federal Power Commission for a preliminary permit to construct three diversion dams and a 7-mi. conduit, and power house at the headwaters of the San Gabriel river, Los Angeles county.

Santa Paula, Cal.—The board of trustees is considering the purchase of an electric fire alarm.

CANADA.

Callender, Ont.—The high-tension line of the Hydro-Electric Co., from Nipissing to Callender, was damaged by fire on Jan. 24.

Montreal, Que.—The town council of Montreal West plans to construct an electric light plant and system at an estimated cost of $117,000.

INCORPORATIONS.

Miami, Fla.—Electric Sun Co. Capital, $220,000. To manufacture electrically operated display signs. Incorporators: W. J. Van Vieck, K. R. Morgan and Charles D. Winters, Asbury Park, N. J.

Los Angeles, Cal.—Price Machine & Electric Works. To manufacture electrical products, etc. Incorporators: Morris Price, 4323 South Olive street, and others.

Jersey City, N. J.—Electric Railway Securities Corp. Capital, $1,000,000. To deal in public utility securities. Incorporators: H. A. Black, Alfred McCabe and John R. Turner.

Worcester, Mass.—E. M. Fay Electric Co., Inc. Capital, $100,000. To manufacture electrical equipment. Incorporators: W. H. Stanton, M. H. and E. Miller Fay, 10 Morningside road.

Boston, Mass. — Schumaker-Santry Co. Capital, $200,000. To manufacture power plant machinery and general electrical specialties. Incorporators: Joseph V. Santry, Brookline; Harry H. Leathers, Melrose; and Ernest M. Chapin, Newton.

Boston, Mass.—Hogkins Engineering Co. Capital, $100,000. To manufacture electric motors and other kindred machinery. Incorporators: Ernest G. and H. M. Hodgkins, West Somerville; and E. C. Morrison, East Boston.

Rochester, N. Y.—Rochester Electric Sun Signs, Inc. Capital, $40,000. To manufacture outdoor electric displays. Incorporators: H. D. Gardner, B. M. Olcott and V. H. Clymer, Syracuse.

New York, N. Y.—The Times Appliance Co. Capital, $60,000. To manufacture electrical appliances and equipment. Incorporators: B. A. and E. A. Allen, and E. B. Ingraham, 1475 Broadway.

New York, N. Y.—Adel Flashlight Co. Capital, $20,000. To manufacture electric flashlights and other electrical specialties. Incorporators: J. and B. Adelman, L. Engelson, 553 East Third street, Brooklyn.

New York, N. Y.—Ames Electric Co. Capital, $37,000. To engage as electrical contractors. Incorporators: W. E. Sobey, A. A. Koivu, and M. E. Ames, 600 West 157th street.

Los Angeles, Cal.—Paramount Electric Fixture Co. To manufacture electric-lighting fixtures. Incorporator: J. J. Strauss, 5737 Virginia avenue.

Kansas City, Mo.—Fuel Oil Service Corp. Capital, $1,000,000. To manufacture lighting and power-plant equipment. Incorporators: Edward M. Shoen, Frederick Weeks and M. J. Hurst.

Cleveland, O.—Commercial Electric Manufacturing Co. Capital, $250,000. To manufacture electrical devices and equipment. Incorporators: R. W. Anderson, H. F. Zipkin, W. W. Hale and others.

Cleveland, O.—Johnson-Davis Co. Capital, $20,000. To manufacture electrical equipment. Incorporators: Thomas C. Johnson, Chester P. Davis and others.

Seattle, Wash. — Duplex Battery Sales Corp. Capital, $10,000. To manufacture electrical batteries. Incorporators: Kerr, McCord & Ivey, 1309 Hoge building, Seattle.

New Castle, Pa.—Buckeye Electric Co. Capital, $15,000. Incorporators: Fred Maciarello, Thomas W. Ross and others.

Detroit, Mich. — Detroit Willys Light Co. Capital, $25,000. Incorporators: Harry R. Price, Russell V. Judson and others.

Hamilton, Can.—Equator Manufacturing Co., Ltd. Capital, $40,000. To manufacture electrical equipment, etc. Incorporators: James B. Johnson, William W. Gabbott and others.

Toronto, Can.—Charles A. Branston, Ltd. Capital, $100,000. To manufacture electrical appliances, etc. Incorporators: Johnston W. Dixon, Richard G. McClelland, Arthur M. Hunt and others.

Oklahoma City, Okla.—Metropolitan Electric Service Co. Capital $50,000. To manufacture electrical equipment. Incorporators: Cody Fowler, Walter W. Hawkins, T. N. Wells and others.

New York, N. Y.—Americolite Co. Capital, $250,000. To manufacture electrical fixtures. Incorporators: P. G. Moore, H. P. Whidden and R. M. Beard, 101 Park avenue.

Baltimore, Md.—Standard Electric & Supply Co. Capital, $50,000. To manufacture electrical equipment and supplies. Incorporators: Chester M. Valentine, Chilton Ellett and John E. Martin, St. James apartments, Baltimore.

Worcester, Mass.—Bilt-Rite Equipment Co. Capital, $150,000. To manufacture electrical appliances. Incorporators: Charles L. Jernberg, G. A. Johnson and Joseph T. Lord, 324 Highland street.

Hartford, Conn.—Paragon Power Specialties Co. Capital, $5000. To manufacture electrical and other power equipment. Incorporators: H. C. Bailey, L. Z. Richards, J. D. Cherry, 163 North Whitney street.

Newark, N. J.—Electric Lamp Co. has filed notice of organization to manufacture electric lamps, with office at 79 Orange street. Raxann Konkle, 28 Chester avenue, heads the company.

New York, N. Y.—Hard Fibre & Insulation Co. Capital, $50,000. To manufacture electrical insulation products. Incorporators: A. N. Sohmer, W. E. Dancink and J. W. Canter, 952 Simpson street.

New York, N. Y.—Thornton Transformer Co. Capital, $50,000. To manufacture electrical transformers and other products. Incorporators: W. Brewster, H. C. Smith and G. A. Thornton, 30 Church street.

New York, N. Y.—O-B Electric Vehicles, Inc. Capital, $500,000. To manufacture electrically operated automobiles. Incorporators: W. H. Bloom, W. J. Bergold and T. F. Baumann, 307 East 90th street.

Almond, N. Y.—Western New York Farm Light & Power Co. Capital, $6000. To manufacture electric plants and equipment for rural service. Incorporators: H. A. and G. A. Guenther, and L. B. Stewart.

New York, N. Y.—Reimers Electric Appliance Co. Capital, $60,000. To manufacture electrical appliances and equipment. Incorporators: W. K. Tavender, D. Koppan and A. E. Reimers, 513 West 50th street.

PROPOSALS.

Centralia, Wash.—Bids will be received by the city council this month for an ornamental street lighting system, which will cost about $22,000.

Chambersburg, Pa.—A. C. Woods, engineer, Stock Exchange building, Philadelphia, has prepared plans for the erection of an electric power plant for Chambersburg. The cost is estimated at $150,000. J. H. Mowrey will receive bids Feb. 15.

Freeburg, Ill.—Fuller & Beard, engineers, Chemical building, St. Louis, have prepared plans for the erection of an electric lighting and power plant for the city. Bids will be received April 1 by Mayor Reinheimer.

Springfield, Ill.—Wade Seeley, engineer, City Hall, has prepared plans for the erection of a lighting system for the city, estimated to cost $81,000. C. T. Baumer is mayor. Bids will be received until March 15.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks

Oklahoma Gas & Electric Co. Gold Bonds Offered.

Bonbright & Co., E. H. Rollins & Sons, Federal Securities Corp., Spencer Trask & Co., and H. M. Byllesby & Co., Chicago, are offering a new issue of $6,000,000 Oklahoma Gas & Electric Co. first and refunding mortgage 7% gold bonds, dated Feb. 1, 1921, and due Feb. 1, 1941, at 95 and accrued interest, yielding about 8%. The Oklahoma Gas & Electric Co. was incorporated in 1902, and is the largest electric and gas utility in the state. The system comprises modern and efficient electric generating plants with a total installed capacity of 26,000 hp. and distributed electricity and natural gas, serving many important cities in Oklahoma, including Oklahoma City, Muskogee, Sapulpa, El Reno, Enid, Drumright and other towns, with a total population estimated at 225,000. The proceeds from the sale of these bonds, and from the sale of the bond-secured 8% convertible gold notes, due Feb. 1, 1931, and preferred stock will provide funds for the retirement of certain underlying bonds and notes and payment of floating debt incurred for extensions and additions to the property.

Offer of Southern California Edison Co. Bonds.

Harris Trust & Savings Bank, E. H. Rollins & Sons and The National City Co., Chicago, are offering an issue of $5,000,000 Southern California Edison Co. general and refunding mortgage 6% gold bonds, due Feb. 1, 1944, at 87.50 and interest, yielding over 7.10%. The Southern California Edison Co. supplies electric light and power to over 150 cities and towns, including Los Angeles, serving an area of 55,000 sq. mi. and a population of over 1,300,000. The generating plants operated by the company have a total capacity of 311,800 hp., of which 176,000 is derived from water power. For the year ended Dec. 31, 1920, the gross earnings were $14,648,000; net earnings were $8,249,000, or more than two and one-half times the annual mortgage-bond interest charges of $3,294,630. The company has paid dividends on its common stock since 1910; the rate, which has been 7% for the last 4 yrs., has been recently increased to 8%. These bonds are recommended for investment.

Issue of Eastern Texas Electric Co. Bonds.

Stone & Webster, Inc., 919 First National Bank building, Chicago, are offering an issue of Eastern Texas Electric Co. 5% gold mortgage bonds, due in 1942. Both the gross and net earnings of the company have more than doubled since 1913 and are increasing steadily. The net earnings are now well over seven times the total bond interest charges. Price and descriptive circular sent on application.

Duquesne Light Co.

For the nine months ended Sept. 30, 1920, the gross earnings of the Duquesne Light Co. were $10,812,135; net earnings, $3,144,192; gross income, $3,694,534, and net income, $2,518,563.

Detroit Edison Co.

For the year ended Dec. 31 last net income, after interest on funded and unfunded debt, was $2,070,936, compared with $2,556,735 in 1919.

Cities Service Co.

The company closed 1920 with gross earnings of $24,698,039 for the year, an increase of $4,720,489 over 1919. After providing for all expenses, taxes, interest, preferred dividends and other charges, the balance for the year available for reserves, dividends on the common stock, and surplus was $17,370,464, an increase of $4,234,873 over the preceding year. This balance for 1920 was equivalent to $43.09 a share on the average amount of common stock outstanding, as compared with $39.09 a share on the common stock outstanding in 1919. In December gross earnings increased $68,304 and net, after interest charges, increased $64,304 over that for the same month of 1919.

Standard Gas & Electric Co.

An increase of $115,716 in net revenue is reported for the calendar year 1920, the total being $3,076,612. After all interest charges, amortizations and dividends on preferred the balance to surplus was $713,985, or 5.62% on the $12,679,550 of common stock outstanding. This is after leaving approximately $1,600,000 in the subsidiary companies for surplus and reserves, which compares with 7.59% earned on the outstanding common stock for the year 1919, after leaving approximately $1,100,000 in the subsidiary companies for surplus and reserves. The total surplus account on Dec. 31, 1920, was $2,637,273.

Montreal Light, Heat & Power Co.

The Montreal Light, Heat & Power Co., Montreal, Que., reports a net income for the past year of $3,804,506, after charges and ordinary taxes are deducted. The gross business for the year was $12,748,410, as compared with $10,939,272 in 1919.

Edison Light & Power Co.

The Edison Light & Power Co., York, Pa., did a gross business here of $377,272.66 in 1920, and in accordance with its franchise agreement with the city will pay 3% of this amount to the municipality. The York Railways did a gross business of $366,705.40 in the year, and will pay a like percentage. The total amount to be received by the city is $22,319.33.

Great Western Power System.

	1920.	1919.
December gross	$ 669,622	$ 520,438
Net after taxes	416,446	294,492
Surplus after charges	196,913	95,052
Twelve months' gross	6,543,948	5,393,598
Net after taxes	3,649,108	3,083,156
Surplus after charges	1,190,139	905,316

Texas Power & Light Co.

	1920.	1919.
November gross	$ 542,725	$ 354,650
Net after taxes	174,991	137,637
Total income	175,226	138,081
Surplus after charges	114,832	84,111
Twelve months' gross	4,745,304	3,462,433
Net after taxes	1,361,995	1,136,656
Total income	1,366,487	1,144,685
Surplus after charges	679,860	471,060
Balance after preferred dividends	415,610	222,560

Nebraska Power Co.

	1920.	1919.
November gross	$ 276,711	$ 240,168
Net after taxes	75,290	94,899
Total income	106,150	125,006
Surplus after charges	71,461	94,173
Twelve months' gross	2,831,754	2,367,369
Net after taxes	843,187	833,860
Total income	920,644	932,393
Surplus after charges	523,082	583,798
Balance after preferred dividends	313,082	373,798

Central Mississippi Valley Electric Properties.

	1920.	1919.
December gross earnings	$ 44,915	$ 41,923
Net earnings	11,394	8,722
Surplus after charges	7,498	6,129
For calendar year—		
Gross earnings	490,984	424,475
Net earnings	122,817	84,901
Surplus after charges	88,636	55,136

Virginia Railway & Power Co.

	1920.	1919.
Deeember gross	$1,045,536	$ 862,549
Net after taxes	310,881	348,815
Total income	322,255	360,582
Surplus after charges	134,626	107,354
Six months' gross	5,779,545	4,792,051
Net after taxes	1,498,862	1,873,205
Total income	1,574,633	1,957,884
Surplus after charges	420,249	544,739

Note—6% of gross was charged off for depreciation, which, in 1920 was included in operating expenses and in 1919 as a separate charge.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiled & Co., Rookery Bldg., Chicago.

	Div. rate. Per cent.	Bid Feb. 1.	Bid Feb. 8.
Public Utilities—			
Adirondack Electric Power of Glens Falls, common	6	13	13
Adirondack Electric Power of Glens Falls, preferred	6	71	72
American Gas & Electric of New York, common	..	100	102
American Gas & Electric of New York, preferred	6	37	37
American Light & Traction of New York, common	..	85	89
American Light & Traction of New York, preferred	6	75	71
American Power & Light of New York, common	4	45	45
American Power & Light of New York, preferred	6	65	65
American Public Utilities of Grand Rapids, common	..	10	8
American Public Utilities of Grand Rapids, preferred	7	18	18
American Telephone & Telegraph of New York	..	99	99
American Water Works & Elec. of New York, common	..	2	3
American Water Works & Elec. of New York, particip	7	4	6
American Water Works & Elec. of New York, 1st preferred	..	39	39
Appalachian Power, common	..	3	3
Appalachian Power, preferred	7	20	20
Cities Service of New York, common	+extra	255	254
Cities Service of New York, preferred	6	67	68
Commonwealth Edison of Chicago	8	106	105
Comm. Power, Railway & Light of Jackson, common	..	14	13½
Comm. Power, Railway & Light of Jackson, preferred	6	35	34
Federal Light & Traction of New York, common	..	5	6
Federal Light & Traction of New York, preferred	..	43	42
Northern States Power of Chicago, common	..	43	43
Northern States Power of Chicago, preferred	ex.div.7	79	79
Pacific Gas Electric of San Francisco, common	..	48	48
Public Service of Northern Illinois, Chicago, common	7	76	76
Public Service of Northern Illinois, Chicago, preferred	6	80	80
Standard Gas & Electric of Chicago, common	..	12	12½
Standard Gas & Electric of Chicago, preferred	8	35	35
Tennessee Railway, Light & Power of Chattanooga, common	..	1	1
Tennessee Railway, Light & Power of Chattanooga, preferred	6	4	5
Western Power of San Francisco, common	..	21	23
Western Union Telegraph of New York	extra	81	81
Industrials—			
Electric Storage Battery of Philadelphia, common	4	98	98
General Electric of Schenectady	8	127	127
Westinghouse Electric & Mfg. of Pittsburgh, common	7	45	45